DOCUMENT RESUME

ED 024 399

JC 680 469

A Study of Technology Programs: College-Level.
Rochester State Junior Coll., Minn.
Pub Date 68
Note-97p.
EDRS Price MF-$0.50 HC-$4.95
Descriptors-Civil Engineering, Data Processing, Drafting, Electronic Technicians, Health Occupations, *Junior Colleges, Mechanical Design Technicians, Nursing, *Paramedical Occupations, *Subprofessionals, *Technical Education, *Technical Occupations
Identifiers-*Minnesota

Several current technology programs are evaluated and, where appropriate, changes recommended. Jobs at both entry and subsequent promotion levels are described, and manpower needs surveyed. Ordinarily, it is only after discussion with prospective employers (industrial, clinical, medical) that curriculums are adopted and costs estimated for instruction, laboratory facilities, supplies, and supporting staff. For Civil Engineering, the study recommends certain course revisions, more staff, and increased scope. The Drafting and Design program should be broadened to include a manufacturing major and renamed Mechanical Technology. Electronics Technology should be redesigned and strengthened, and expanded to include a Medical Electronics option in second year. Laboratory Technology should be replaced by a Clinical Laboratory program, emphasizing clinical training at local medical institutions. The Nursing program, begun in 1968, will be evaluated at a later date. Psychiatric Technology, studied as a possible program, is, for several reasons, not recommended. X-ray Technology is considered a desirable program, but only after agreement has been reached with local medical institutions on cost, facility, and personnel sharing. Data Processing is recommended as an addition to the curriculum in 1970. Other health-related technologies (dental hygiene, inhalation therapy, dietetics, medical records) should be studied for possible adoption. Existing programs in medical technology and occupational and physical therapy are to be re-examined. (HH)

ED0 24399

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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# A Study Of
# TECHNOLOGY PROGRAMS
## College - Level

- Engineering
- Health
- Business

Rochester State Junior College
Rochester, Minnesota
Summer 1968

JC 680 479

# ACKNOWLEDGEMENTS

For their most generous help and guidance throughout the duration of this study, the workshop committee wishes to convey its special thanks to the representatives of our cooperating institution, the University of Minnesota.

In addition, the committee wishes to thank the great many consultants and resource persons from industry and from the institutions visited for their kind cooperation and advice during the investigative phases of this study. The specific names of individuals, institutions and industries participating are listed at the beginning of each section of this study.

# INTRODUCTION

## I. PURPOSE OF THE STUDY

Briefly stated, the intent of this series of curriculum studies in various college-level career programs is three-fold:

A. To evaluate existing career programs and to make recommendations which will strengthen and improve these programs.

B. To determine the feasibility of implementing new career programs in certain engineering-related, health-related and business-related technologies.

C. To recommend an over-all priority of actions to be taken by the college, the Minnesota State Junior College Board and ultimately by the Minnesota Legislature in improving or establishing new career programs.

## II. METHODS EMPLOYED

As will be evident in Part I of each section, a variety of techniques was used to gather information for the writing of this study:

A. A selected group of institutions were visited by members of the curriculum workshop. Department heads, deans and directors were interviewed using a check list to record data.

B. Consultants were employed from various colleges and universities, federal and state agencies and from private industries in Minnesota and the local area.

C. A great variety of publications were studied by workshop members in order to become as knowledgeable as possible in the general field of technology and in their specific area of responsibility.

## III. SUPPORT

This study was made possible by a federal grant under Title III of the Higher Education Act of 1965. Title III of this act provides funds for "Strengthening Developing Institutions".

## WORKSHOP STRUCTURE

### Rochester State Junior College - Developing Institution

| | |
|---|---|
| Project Coordinator | Verlyn W. Heldt,<br>Dean of Instruction |
| Project Director | Donald W. Lavine<br>Chairman of Technology Division |
| Assistant Project Director | Donald K. Harkcom,<br>Chairman of Business Division |

### Engineering-Related Technologies

| | |
|---|---|
| John H. Champlin | Instructor in Electronics, Physics |
| Lane D. Grant | Instructor in Physics, Physical Sciences |
| Ronald E. Hall | Instructor in Physical Sciences |
| Donald W. Lavine | Instructor in Engineering Drawing |
| Rodney A. Mendenhall | Instructor in Electronics, Mathematics |

### Health-Related Technologies

| | |
|---|---|
| Lyle V. Madsen | Instructor in English |
| Gordon R. Meyers | Instructor in Biological Sciences, Chemistry |
| James M. Russell | Instructor in History |
| Jerry L. Tammen | Instructor in Biological Sciences, Chemistry |

### Business-Related Technologies

| | |
|---|---|
| Russell R. Blankenfeld | Instructor in Mathematics |
| John W. Bradley | Audio Visual Director |
| Donald K. Harkcom | Instructor in Economics |

### University of Minnesota - Cooperating Institution

### University of Minnesota, Rochester Extension Division

Dr. Wilbur L. Wakefield
Dean E. Fritze

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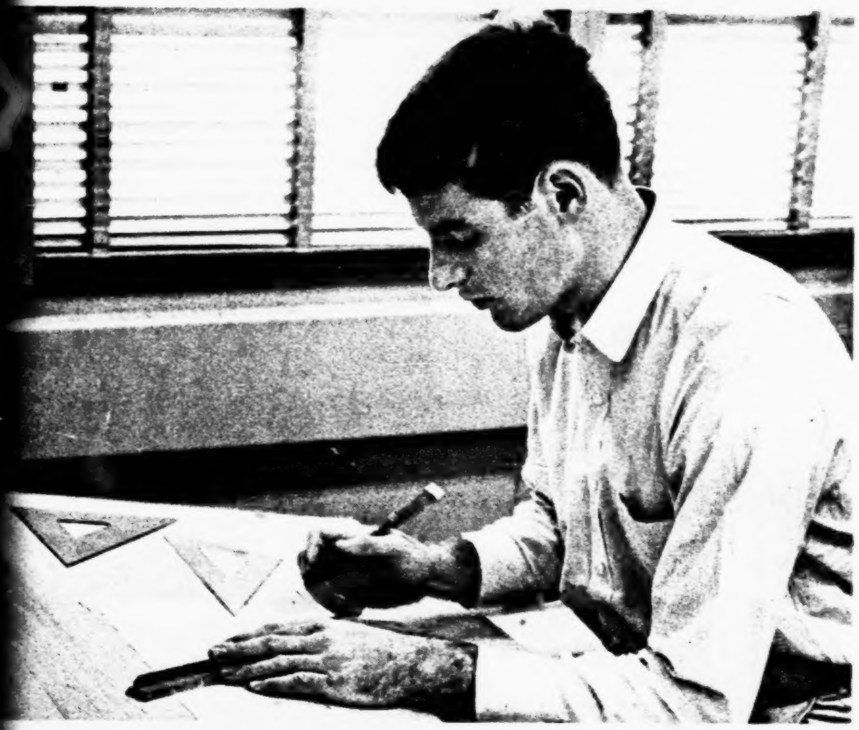


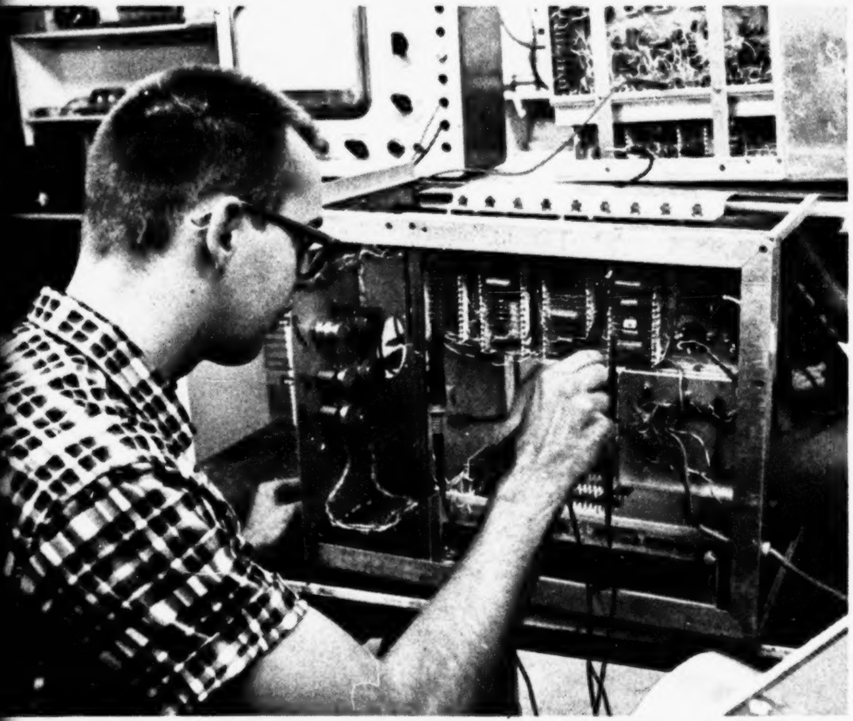
# Engineering - Related Technologies

- CIVIL ENGINEERING TECHNOLOGY

- DRAFTING & DESIGN TECHNOLOGY
  Revised to:
    MECHANICAL TECHNOLOGY
      DRAFTING & DESIGN MAJOR
      MANUFACTURING MAJOR

- ELECTRONICS TECHNOLOGY
  WITH MEDICAL ELECTRONICS OPTION

Subcommittee
John H. Champlin
Lane D. Grant
Ronald E. Hall
Donald W. Lavine
Rodney A. Mendenhall



# Civil Engineering Technology

## I. INVESTIGATIVE TECHNIQUES

### A. Consultants

1. Out-of-state

Dr. Harold Ellis, Head, Technical Institute, Iowa State University
Professor Stephen G. Steele, Chairman, Civil Technology Broome Technical Community College
Professor Robert L. Gumbert, Construction Technology, Iowa State University
Dr. Harry A. Panton, Head, Civil Technology, Erie County Technical Institute

2. Local

Mr. John S. Rother, Instructor, Civil Engineering Technology, Rochester State Junior College
Mr. K. M. McGhie, P.E., Mc Ghie & Betts Consulting Engineers, Rochester

### B. Investigative Trips

Broome Technical Community College, Binghamton, New York
Erie County Technical Institute, Buffalo, New York
Hudson Valley Community College, Troy, New York
Iowa State University, Ames, Iowa
Milwaukee Technical College, Milwaukee, Wisconsin
State University of New York at Alfred
The Junior College District, St. Louis County, Missouri

### C. Materials Examined

1. Catalogs and various publications from the above named institutions.

2. *Civil Technology, Highway and Structural Options*, U. S. Department of Health Education and Welfare, 1966.

3. Evaluation Report of Technology Programs at Rochester State Junior College by the Engineering Technology Committee, Engineers' Council for Professional Development, May 23, 1968.

4. *Occupational Outlook Handbook*, United States Department of Labor, 1966-67.

5. *Occupational Outlook, The Minneapolis-St. Paul Metropolitan Area*, Minnesota Department of Employment Security, 1966.

6. *Report of Civil Engineering Technology Consultant's Workshop*, American Association of Junior Colleges, 1967.

7. *Supplement to Rochester's Manpower*, Rochester Office of Minnesota State Employment Service.

## II. EVALUATION OF EXISTING PROGRAM

### A. *Description of the Occupation*

Civil engineering technicians hold a wide variety of semi-professional positions in private consulting firms and in municipal, county, state and federal agencies. They work very closely with the civil engineer assisting in detailed design work, testing materials, surveying, estimating, supervising construction, report writing, and many other engineering functions. Civil engineering technicians generally will not hold prime responsibility for engineering projects since this is the responsibility of registered professional engineers. In all projects, they work closely with and remain accountable to professional engineers. Below are a group of typical positions held by graduates of a civil engineering technology program. Many of these positions are entry-level positions while others are positions obtained only through experience, additional training and promotion.

Chief of Party
Construction Equipment Salesman
Engineering Aide
Engineering Draftsman
Equipment Supervisor
Estimator
Expediter
Highway Construction Foreman
Highway Construction Inspector
Highway Construction Supervisor
Highway Contractor
Highway Surveyor
Highway Contractor's Aide
Instrument Man
Layout Man
Materials Salesman
Materials Tester
Quantity Surveyor
Rod Man
Structural Detailer
Structural Draftsman
Topographical Draftsman

### B. *What are the manpower needs?*

To determine the need for civil engineering technicians, the future employers of the graduates of two-year civil engineering technology programs must be informed as to just how the technician can be used in their particular organizations. Very little information is available to determine the need for engineering technicians in a particular locality for a particular type of technology. Therefore, various indices related to the manpower needs for engineeers and scientists must be used. The Engineering Manpower Commission in a recent publication entitled Demand for Engineers and Technicians, 1966, indicates that 94% of the state government engineers have civil engineering degrees. The projected figures indicated this trend will continue. This report also indicates that the percentage of civil engineers who are employed in federal government operations will increase from 29 percent to 40 percent; whereas, the civil engineers in consulting work will decrease from 61 percent to 46 percent, and in local governments from 87 percent to 73 percent, mainly due to technicians performing jobs which are presently being done by engineers. Therefore, if the ratio of three technicians per engineer is applied, the demand for civil engineering technicians will increase at a greater rate than for civil engineers. (Civil Engineering Technology Consultant's Workshop; May 17-20, 1967; Atlanta, Georgia)

TABLE III Future Needs for Civil Engineers and Civil Engineering Technicians

| | Per cent of civil engineers hired for this activity | | Per cent increase in technicians from samples |
|---|---|---|---|
| Activity | 1966 | 1967 est. | 1965-1976 |
| Aerospace | 9 | 8 | 62 |
| Construction | 40 | 39 | 58 |
| Consulting | 61 | 46 | 61 |
| Research | 1 | 1 | 27 |
| Transportation | 7 | 27 | 133 |
| Utilities | 10 | 7 | 12 |
| Federal Government | 29 | 40 | 13 |
| State Government | 94 | 92 | 22 |
| Local Government | 87 | 73 | 27 |
| Education | 15 | 14 | 104 |

From: Occupational Outlook - The Minneapolis-St. Paul Metropolitan Area, 1966

Civil Engineers

| | | |
|---|---|---|
| Total Employment November 1963 - | | 1,488 |
| 1963 Vacancies | 26 | |
| Needed for Expansion | 313 | |
| Needed for Replacement | 109 | |
| Total Needed to Nov. 1968 | | 448 |
| Civil Engineers Needed in 1968 - Total | | 1,936 |

Based on a ratio of three technicians for one engineer (as used by Civil Engineering Technology Consultant's Workshop conducted by the American Association of Junior Colleges Occupational Education Project, May 17-20, 1967, Atlanta, Georgia) the projected needs for civil engineering technicians in 1968 in the Metropolitan area alone would be a total of approximately 6,000 civil engineering technicians.

In the local area, southeastern Minnesota, there are approximately 80 civil engineers. In Rochester proper there are approximately 40 civil engineers. Using the same ratio as the Civil Engineering Technology Consultant's Workshop used in 1967, the local need could be estimated at 240 civil engineering technicians.

It would be presumptuous to assume there are 240 civil engineering technician positions available at present in the local area. It is not presumptuous, however, to conclude that if the civil engineers of the area were better informed as to the qualifications and availability of civil engineering technicians that more and more of these positions would be filled by a civil engineering technology graduate.

C. How are these needs currently being met?

The current need for civil engineering technicians is not being met at the local, state or national level. At present, this study is basically concerned with local and state needs. In Minnesota, the area vocational-technical schools at Mankato, St. Paul, Winona and Wadena offer a 9-12 month program in Highway Technology. These four schools graduated 73 highway technicians in 1968.

The civil engineering technology program is a two-year associate degree program. This program is designed to provide technicians with a broader and less specialized background than the highway technician. It also is designed to cover that area of knowledge between the professional civil engineer and the highway technician.

At the present time, there is one college in Minnesota which offers a two-year associate degree civil engineering technology program. This college, Rochester State Junior College, graduated its first class of five in 1967. Its second class of six were graduated in 1968. It can readily be seen that many more programs in civil engineering technology need to be implemented in Minnesota.

## D. Description of the Curriculum

The present curriculum was designed to provide basic courses in mathematics, physics, technical drawing and English prior to specialization in various civil engineering technology courses. Engineering 314 (Plane Surveying) occurring in the spring quarter of the freshman year is the first technical speciality course in the program. The sophomore year is devoted primarily to technical speciality courses plus the addition of certain English, business, health, social science and humanities courses that were felt to be vital in educating a well-rounded, semi-professional engineering technician.

In examining our present program in drafting and design, the reader will note the first two quarters of the drafting and design technology and civil engineering technology programs are common. In effect, freshman begin their option (drafting and design technology or civil engineering technology) after the completion of the fall and winter quarters.

## PRESENT CURRICULUM

### Freshman Year

| | | Credits | | |
|---|---|---|---|---|
| | | F | W | S |
| English 327-328 | Technical English | 3 | 3 | - |
| Speech 311 | Fundamentals of Speech | - | - | 3 |
| Drawing 114 | Basic Engineering Drawing | 4 | - | - |
| Drawing 115 | Descriptive Geometry | - | 4 | - |
| Tech. Math 317-318-321 | Technical Mathematics | 5 | 5 | 5 |
| Tech. Science 314-315 | Technical Physics | - | 4 | 4 |
| Engineering 314 | Plane Surveying | - | - | 5 |
| P.E. 101-102-103 | Physical Education | 1 | 1 | 1 |
| Engineering 311 | Orientation to Technology | 1 | - | - |
| | *Electives | 3 | - | - |
| | | 17 | 17 | 18 |

### Sophomore Year

| | | Credits | | |
|---|---|---|---|---|
| | | F | W | S |
| Tech. Science 316 | Technical Physics | 4 | - | - |
| Engineering 315 | Topographic & Route Surveying | 5 | - | - |
| Engineering 316 | Advanced Surveying | - | - | 5 |
| Drawing 431 | Elements of Mapping | 2 | - | - |
| Drawing 432 | Civil Engineering Drafting | - | - | 4 |
| Engineering 410 | Hydrology & Geology | 4 | - | - |
| Engineering 411 | Soils & Materials Analysis | - | 5 | - |
| Engineering 412 | Engineering Computations & Inspection Procedures | - | 5 | - |
| Phy. Science 122 | Elements of Chemistry | - | 4 | - |
| English 411 | Technical Writing | - | - | 3 |
| Business 411 | Human Relations | - | - | 2 |
| Health 114 | First Aid | 3 | - | - |
| | *Electives | - | 3 | 3 |
| | | 18 | 17 | 17 |

*A minimum of eight credits in the social sciences and humanities must be earned in order to fulfill the college's general educational requirements.

NOTE: A proposed revision of the curriculum is included in the section on recommendations.

### E. Student Admission Requirements

Applicants for admission to technology programs must have been graduated from an accredited high school or have had an equivalent education. In addition, the applicant must also exhibit the necessary aptitude, interest and desire for completion of a technology program. Summarized below is a series of GUIDELINES FOR ENTRANCE TO TECHNOLOGY PROGRAMS. These guidelines were developed during joint meetings of the members of the technology division, the college counseling bureau and the Director of Admissions.

1. HIGH SCHOOL BACKGROUND
    a. At least three units of English.
    b. Two units of mathematics, one of which is in algebra and the other in plane geometry. In addition to these minimum units, intermediate algebra and trigonometry are desirable.
    c. One unit of physical science is desired. This unit should be in physics.

Deficiencies in high school course work must be made up before admission to a technology program, however, a student may be admitted to the college in a general course of study designed to provide necessary background.

If deficiencies are made up through summer session attendance, service schools, industrial experience or correspondence courses, a student may enter a technology program in the fall quarter.

2. HIGH SCHOOL ACADEMIC ACHIEVEMENT

Average or above average grades in the courses described in Item I are necessary for success in any technology program, however, a high interest, a reasonable aptitude and a strong desire can often overcome a weak achievement record.

3. INTERESTS

The key to a successful technician can often be found in his interests. The first-rate technician usually:

a. "has always enjoyed tinkering with machines, devices, engines, etc."

b. "enjoys theoretical ideas but prefers seeing how they can be applied."

c. "likes doing things right - has developed a sense of precision, craftsmanship."

4. APTITUDE

Various tests have been developed for helping to predict success in technology programs. Both high school and college counselors use any or all of those listed below. In addition, the test results are extremely helpful to college advisors in advising students in their selection of courses.

MSAT - Minnesota Scholastic Aptitude Test
MPFB - Minnesota Paper Form Board (Spatial Visualization)
ACT - American College Tests
MMT - Minnesota Mathematics Test

Because the entire field of technology is relatively new, there is a decided lack of information as to which tests have the highest validity in predicting success.

5. DESIRE

The student's desire to become a technician, although difficult to measure, is considered to be an absolutely vital factor in achieving success. Many times a student who has shown little if any desire in high school will "catch fire" in the atmosphere of a college class.

6. ORIENTATION

Every effort should be made by the student, together with his parents, counselors, and teachers, to acquaint himself with: the nature of technical occupations, the role of the technician and his relationship to the professional engineer and skilled craftsman.

The student should avail himself of descriptive brochures regarding technology. He should seek every opportunity to visit industrial firms and engineering offices and, if possible, talk with technicians and engineers in the field.

With the help of his parents and counselors, the student should strive to understand himself, his interests, his aptitudes, his desires.

F. Costs

1. Facilities and Equipment Available on Old Campus

a. Drafting Laboratory, Room 307, Coffman Building

Individual drafting desks, stools and drafting machines were provided for a class of 27 students.

b. Soils Laboratory, Minnesota State Highway Department
The MSHD District Office, located in Rochester, made their soils and materials laboratory available to our instructor and his students for their course in soils and materials analysis.

c. Mayo Civic Auditorium
The auditorium manager, Mr. Calvin Smith, made available a locked storage room in which our surveying

field equipment cabinet was stored. In addition, the Rochester City Council granted us permission to use Mayo Park in which to conduct field problems. All surveying instruments and field equipment for a class of twelve students were provided at an approximate cost of $6,000.00.

2. Facilities Available on New Campus

   a. Room S-210

   The new drafting lab is equipped with six industrial-type drafting stations and 18 student-type stations. The total cost of all drafting tables, stools, drafting machines, printing machine, etc. was approximately $8,300.00.

   b. Room S-208

   The new civil engineering technology laboratory is equipped to handle all classes in surveying, soils and materials analysis, civil engineering drafting, calculations, etc. The approximate cost of equipping this laboratory was $22,000.00 plus the surveying equipment we already had in possession.

3. Staff

   The classes in the first two quarters of the program are taught by various members of the college staff who possess a special competence in teaching technical mathematics, technical physics, technical drawing, etc. The specialized classes in civil engineering technology, e.g., surveying, mapping, civil engineering drafting, soils and materials analysis, computations and inspection techniques, etc., are taught by a graduate engineer with nine years of field experience in mining and civil engineering.

4. Supplies

   Approximately $300.00 per year was spent for expendable supplies and materials during the 1966-67 and 1967-68 academic years.

G. Special Problems

1. There is a problem characteristic of all technology programs in attempting to obtain students to enter and continue successfully in the program. The attrition rate in most schools visited was 40-50%.
2. The two-year technology graduate is unique in the sense that he must be employable in an entry-level job. This means that a school offering a technology program should have as a service to the student and to business and industry an adequate placement bureau. Contrast this to a typical junior college transfer program from which students are not generally seeking permanent employment.
3. To implement and maintain any up-to-date technology program, it is absolutely necessary to employ instructors who have been in industry. Therefore, to obtain instructors, it becomes necessary to compete with the salaries offered in industry.
4. A low student-teacher ratio which is necessitated by "hands-on" laboratory courses is necessary and highly recommended by industry. This also points out the amount and high cost of top quality industrial equipment which

must be available to the student.

5. There is need for the publicizing of information concerning programs to familiarize prospective employers as to where the graduate could fit in to his organization.
6. The maintenance of equipment should be done by a technician in order to allow instructors more time for performing a more meaningful function in terms of instruction.

## H. Recommendations

### Proposed Program Revision for: CIVIL ENGINEERING TECHNOLOGY

### First Year

| | | F | W | S |
|---|---|---|---|---|
| English 327-328 | Technical English | 3 | 3 | - |
| Speech 311 | Introduction to Speech | - | - | 3 |
| Math 317-318-321 | Technical Mathematics | 5 | 5 | 5 |
| Physics 314-315-316 | Technical Physics | 4 | 4 | 4 |
| Drawing 114 | Technical Drawing | 4 | - | - |
| Civil Tech. 314 | Place Surveying | - | - | 5 |
| Health 114 (111) | First Aid (or Personal Health) | - | 3(2) | - |
| P.E. 101-102 | Physical Education | 1 | - | 1 |
| Technology 311 | Orientation to Technology | 1 | - | - |
| | Electives | - | 3-4 | - |
| | | 18 | 17-19 | 18 |

### Second Year

| | | F | W | S |
|---|---|---|---|---|
| Civil Tech. 315 | Route & Topographic Surveying | 4 | - | - |
| Civil Tech. 316 | Advanced Surveying | - | - | 4 |
| Mech. Tech.___ | Strength of Materials | 4 | - | - |
| Civil Tech.___ | Soil Mechancis | 3 | - | - |
| Civil Tech.___ | Hydraulics | - | - | 3 |
| Civil Tech.___ | Construction Materials | 3 | - | - |
| Civil Tech.___ | Construction Methods & Materials | - | 3 | - |
| Civil Tech.___ | Reinforced Concrete Design | - | 3 | - |
| Civil Tech. 431 | Mapping & Photogrammetry | - | 3 | - |
| Civil Tech.___ | Structural Steel Design | - | 3 | - |
| Civil Tech.___ | Highway Design | - | - | 4 |
| Civil Tech.___ | Legal & Economic Aspects of Engineering | - | - | 2 |
| English 411 | Technical Report Writing | - | - | 3 |
| P.E. 103 | Physical Education | - | - | 1 |
| | Electives | 3 | 6 | - |
| | | 17 | 17 | 16 |

1. The above proposal for the revision of the civil engineering technology program should be implemented with the following conditions:
    a. That space and funds be committed for the building and equipment necessary as stated in the revision. This would include additional equipment as follows:

| | Approximate Cost |
|---|---|
| Strength of Materials | $40,000.00 |
| Hydraulics | 5,000.00 |
| Photogrammetry | 5,000.00 |
| TOTAL | $50,000.00 |

    b. A civil engineer with experience in civil engineering be hired. His credentials should include BCK or BS in C.E. P.E. and L.S. with membership in A.S.C.E.
2. The title "Civil Engineering Technology" necessitates courses such as statics, strength of materials and more analytical types of course work to supplement the course work presently offered.
3. One instructor be designated as the lead or head instructor whose function would be to coordinate the entire civil engineering technology program.
4. A summer program be provided that will enable a student to make up high school deficiencies before entering a technology program.
5. A director of placement be hired to service primarily the career areas. He should arrange job interviews for

graduates and to conduct follow-up studies on our graduates after they leave our college.

6. A public relations man be employed to promote all phases of the college. Specifically, he should promote all occupational curricula in so far as high school students, counselors, parents and employers are concerned. This position might well be combined with that of a placement officer.
7. The library must be put on a planned program for expanding its holdings in the civil technology fields. Both books and periodicals are needed.
8. After the establishment of the revised civil engineering technology program, a further option should be established in civil engineering technology often referred to as a "construction major".
9. Adequate secretarial help should be provided.

# Drafting & Design Technology

(revised to Mechanical Technology)

## I. INVESTIGATIVE TECHNIQUES

### A. Consultants

1. Out-of-state

Professor Henry M. Black, Head, Mechanical Technology, Iowa State University
Mr. Arthur P. Carlson, Dean, Technical and Industrial Division, Milwaukee Technical College
Professor David F. Conde, Head, Applications Engineering Department, State University of New York at Alfred
Professor Edward G. Fix, Head, Industrial Technology, Erie County Technical Institute
Professor James D. Forman, Director of Engineering Technology, Anne Arundel Community College
Professor Michael J. Kapral, Chairman, Mechanical Technology, Broome Technical Community College
Professor Frederick W. Lamb, Chairman, Applied Sciences, Flint Community Junior College
Professor William R. Stuart, Head, Mechanical Technology, Erie County Technical Institute

2. In-state and Local

Mr. Leonard Rado, Product Assurance Manager, G. T. Schjeldahl Company
Professor James Reynolds, Department of Industrial Engineering, University of Minnesota

From International Business Machines, Rochester:
LeRoy Dembsky
Donald Harker
Edward Jackson
John Justice
Harold Kamm
Kenneth Mallon
Harry Neilson
Michael Spading

From Crenlo, Incorporated, Rochester:
Gordon Marburger

### B. Investigative Trips

Broome Technical Community College, Binghamton, New York
Erie County Technical Institute, Buffalo, New York
Flint Community Junior College, Flint, Michigan
Henry Ford Community College, Dearborn, Michigan
Hudson Valley Community College, Troy, New York

Iowa State University, Ames, Iowa
Milwaukee Technical College, Milwaukee, Wisconsin
State University of New York at Alfred
The Junior College District, St. Louis County, Missouri

## C. Materials Examined

1. Catalogs and various publications from the above named institutions.
2. Compilation of Technical Education Materials, The Center for Research and Leadership Development in Vocational and Technical Education, Ohio State University.
3. Evaluation Report of Technology Programs at Rochester State Junior College by the Engineering Technology Committee, Engineers' Council for Professional Development, May 23, 1968.
4. Mechanical Drafting and Design Technology, U. S. Department of Health, Education and Welfare, 1962, 1964.
5. Occupational Outlook Handbook, United States Department of Labor, 1966-67.
6. Occupational Outlook, The Minneapolis-St. Paul Metropolitan Area, Minnesota Department of Employment Security, 1966.
7. Planning Report on Programs for Technicians in Minnesota, A Report to The Liason Committee for Higher Education from the Planning Subcommittee, 1964
8. Technical Manpower Needs in Minnesota and the Implications for Educational Planning, A Report to the Liason Committee for Higher Education from The Subcommittee on Technical Education, 1964.
9. Technology and Manpower in Design and Drafting, 1965-75, United States Department of Labor, 1966.

# II. EVALUATION OF EXISTING PROGRAM

## A. Description of the Occupation

Design draftsmen, with a specialization in the mechanical area, are usually employed in the manufacturing industry to transform the concepts of an engineer or senior designer into working drawings which, in turn, are used by skilled craftsmen in making a product. In the course of their work, they may make rough sketches, do various calculations, write specifications, produce detail and assembly drawings, revise or re-design a part, tool, product or machine, compile technical reports, etc. Below is a group of typical positions held by a mechanical design draftsman. Many are entry-level positions while others are positions obtained only through experience, additional training and promotion.

Design Checker
Design Draftsman
Detail Draftsman
Die Designer
Junior Draftsman
Layout Draftsman
Machine Designer
Product Designer
Senior Designer
Senior Draftsman
Tool Designer

### B. What are the manpower needs?

See Part III of this section.

### C. How are these needs currently being met?

See Part III of this section.

### D. Description of the Curriculum

The present curriculum was designed to provide basic courses in mathematics, physics, technical drawing and English prior to specialization in various drafting and design technology courses. Drawing 311 (Applied Engineering Drawing) occurring in the spring quarter of the freshman year is the first technical speciality course in the mechanical design drafting program. As in the case of civil engineering technology, the sophomore year contains various technical speciality courses plus the addition of certain English, business, health, social science and humanities courses that were felt to be vital in educating a design draftsman with good growth potential in industry.

The reader will again note the first two quarters of the present drafting and design technology and civil engineering technology programs are common.

## PRESENT CURRICULUM

| | | Credits | | |
|---|---|---|---|---|
| | Freshman Year | F | W | S |
| English 327-328 | Technical English | 3 | 3 | - |
| Speech 311 | Introduction to Speech | - | - | 3 |
| Drawing 114 | Engineering Drawing | 4 | - | - |
| Drawing 115 | Descriptive Geometry | - | 4 | - |
| Drawing 311 | Applied Engineering Drawing | - | - | 4 |
| Tech. Math 317-318-321 | Technical Mathematics | 5 | 5 | 5 |
| Tech. Science 314-315 | Technical Physics | - | 4 | 4 |
| P.E. 101-102-103 | Physical Education | 1 | 1 | 1 |
| Engineering 311 | Orientation to Technology | 1 | - | - |
| | Electives* | 3 | - | - |
| | | 17 | 17 | 17 |

| | Sophomore Year | F | W | S |
|---|---|---|---|---|
| Technical Science 316 | Technical Physics | 4 | - | - |
| Engineering 413 | Materials and Processes | 5 | - | - |
| Drawing 424 | Industrial Drafting and Design | - | 5 | - |
| Drawing 425 | Elements of Mechanical Design | - | - | 5 |
| Drawing 421 | Applied Descriptive Geometry | - | 3 | - |
| Physical Science 122 | Elements of Chemistry | - | - | 4 |
| Health 114 | First Aid | - | 3 | - |
| Business 411 | Human Relations | - | - | 3 |
| Engineering 421-422-423 | On-the-Job Experience** | 2 | 2 | 2 |
| | Electives* | 6 | 5 | - |
| | | 17 | 18 | 17 |

*A minumum of eight credits in the social sciences and humanities must be earned in order to fulfill the college's general education requirements.

**On-the-Job Experience is optional. Approved classes may be substituted for this sequence.

NOTE: A proposed revision of the present program is included in Part III of this section.

### E. Student Admission Requirements

See section on Civil Engineering Technology.

### F. Costs

#### 1. Facilities and Equipment Available on Old Campus

Drafting Laboratory, Room 307, Coffman Building

Individual drafting desks, stools and drafting machines were provided for a class of 27 students.

2. Facilities Available on New Campus

Room S-210 - The new drafting lab is equipped with six industrial-type drafting stations and 18 student-type stations. The total cost of all drafting tables, stools, drafting machines, printing machine, etc. was approximately $8,300.00.

3. Staff

The classes in the first two quarters of the program are taught by various members of the college staff who possess a special competence in teaching technical mathematics, technical physics, technical drawing, etc. The specialized classes in applied engineering drawing, materials and processes, industrial drafting and design and elements of mechanical design are taught by four part-time instructors. One is a mechanical engineer, two are tool designers, and one is a machine designer. All four are eminently qualified in their speciality and have prior teaching experience in industry.

4. Supplies

Approximately $200.00 per year was spent for expendable supplies and materials during the 1966-67 and 1967-68 academic years.

G. Special Problems and Recommendations

See Part III of this section

## III. FEASIBILITY OF IMPLEMENTING A MECHANICAL TECHNOLOGY PROGRAM

As will be evident in this portion of the report, the committee's recommendation is to revise the present program in drafting and design technology, then offer it as a sophomore "major" together with a manufacturing major under the new title, mechanical technology. The freshman year for both majors would be common.

### A. Description of the Occupation

A mechanical technician with a manufacturing major assists mechanical and industrial engineers in solving problems involving the efficient use of personnel, materials and machines in the production of goods or services. This type of technician may conduct time and motion studies, prepare layouts of equipment and machinery, plan the flow of work, make statistical studies and analyses of production costs, assist in various phases of purchasing, inventory control, etc. Typical positions which the manufacturing major might expect to enter or be promoted to are:

- Assistant Engineer
- Assistant to Industrial Engineer
- Buyer
- Cost Analysis Engineer
- Dispatcher
- Engineering Change Analyzer
- Engineering Scheduler
- Estimator
- Evaluator
- Expeditor
- Industrial Engineer
- Job Planner
- Junior Methods Engineer
- Machine-load Control-planner
- Material Control Analyst
- Methods Analysis Engineer
- Methods Processor
- Parts Analyzer
- Process Engineer
- Production Estimator
- Production Planner
- Production Trainee
- Project Engineer
- Scheduler
- Time Study Clerk
- Tool Planner

B. What are the manpower needs?

As in the case of any technology graduate, prospective employers of mechanical technicians must be fully informed as to just how this type of technician can be used in their particular organization. Very little information is available to determine the needs for engineering technicians in a particular locality for a particular type of technology. Therefore, various indices related to the manpower needs for engineers and scientists must be used. The national need for mechanical technicians is outlined in the Manpower Research Bulletin, Number 12, October 1966, published by the United States Department of Labor. If technological change does not accelerate between 1963 and 1975, requirements for mechanical technicians are projected to increase at roughly the same rate as in the recent past, 5.2% per year or 84% over the period 1963 to 1975.

In Minnesota, the needs are outlined in the Planning Report on Programs for Technicians in Minnesota, December 1964, as follows:

| | 1965 | 1968 | 1970 |
|---|---|---|---|
| Mechanical Technicians | 140 | 225 | 290 |
| Drafting & Design Tech. | 275 | 325 | 350 |

The above figures were obtained from 37 companies employed approximately 80% of all engineers in the state (and presumably, the same proportion of the technicians).

In another study conducted in Minnesota, A Skill Survey of the Minneapolis-St. Paul Area (1966), it is stated that between 1963 and 1968, there will be a need for an additional 230 mechanical technicians for expansion and replacement.

The determination of need in the Rochester area or southeastern Minnesota is difficult to determine. The smaller firms (up to 500 employees) find it difficult to successfully recruit four-year engineering graduates. Indications are that each of these smaller firms has a need now for two or three mechanical technicians with a manufacturing major. There are approximately 20 such firms in southeastern Minnesota. This would indicate a current need for 40-60 such technicians. In Rochester, International Business Machines and Crenlo have indicated support for a mechanical technology program. They expressed disappointment that it could not be implemented immediately.

C. How are these needs currently being met?

In the Planning Report on Programs for Technicians in Minnesota, December 1964, the following information was published:

PLANNING FOR PROGRAMS IN ENGINEERING TECHNOLOGY

| | Mechanical Technology | Drafting & Design |
|---|---|---|
| Needs for 1965 | 140 | 275 |
| Unfilled needs for 1965 | 100 | 125 |
| Number of new programs for 1965 | 2 | 2 |
| Additional annual needs as of 1968 | 85 | 50 |
| Additional programs by 1968 | 2 | 1 |

| | Mechanical Technology | Drafting & Design |
|---|---|---|
| Additional annual needs as of 1970 | 65 | 25 |
| Additional programs by 1970 | 1 | 0 |
| Programs as of 1970 | 5 | 3 |

The above figures indicate a need for new programs in Minnesota to provide for additional annual needs. The Planning Report's estimate that each new program will produce 50 graduates is unrealistic. Experience in other technical schools indicate 20-30 graduates would be closer.

One of the major methods used to meet the needs for technicians is through internal training of their employees. This type of training is slowly being eliminated as indicated by the following information from Technician Manpower, Bureau of Labor Statistics, U.S. Department of Labor.

ESTIMATED NUMBERS OF NEW ENTRANTS INTO
TECHNICIAN JOBS IN THE UNITED STATES

| | 1965 | 1974 |
|---|---|---|
| Post Secondary Pre-employment Technician Training Programs | 21,400 | 53,500 |
| Formal Training within Industry | 20,800 | 17,300 |

The fulfilling of the current needs in the state are lagging now and if the present national trend continues to decline for company internal training, the obvious conclusion is a drastic need for implementation of new mechanical technology programs in two-year post secondary schools and junior colleges.

D. Description of the Curriculum

## Proposed Program in

## MECHANICAL TECHNOLOGY

### Common Year Before Major

| First Year | | F | W | S |
|---|---|---|---|---|
| English 327-328 | Technical English | 3 | 3 | - |
| Speech 311 | Introduction to Speech | - | - | 3 |
| Math 317-318-321 | Technical Mathematics | 5 | 5 | 5 |
| Physics 314-315-316 | Technical Physics | 4 | 4 | 4 |
| Drawing 114-___-___ | Technical Drawing | 4 | 2 | 2 |
| Mech. Tech.___-___ | Manufacturing Processes | - | 2 | 2 |
| Technology 311 | Orientation to Technology | 1 | - | - |
| P.E. 101-102-103 | Physical Education | 1 | 1 | 1 |
| | | 18 | 17 | 17 |

### Drafting and Design Major

| Second Year | | F | W | S |
|---|---|---|---|---|
| Drawing 115 | Decriptive Geometry | 4 | - | - |
| Drawing 424 | Tool Design | 5 | - | - |
| Drawing 425 | Design of Machine Elements | - | 5 | - |
| Drawing ___ | Design Problems | - | - | 5 |
| Mech. Tech. ___ | Strength of Materials | 4 | - | - |
| Mech. Tech. ___ | Metallurgy* | - | 4 | - |
| Mech. Tech. ___ | Plastics | - | - | 3 |
| English 411 | Technical Report Writing | - | - | 3 |
| Health 114 (111) | First Aid (or Personal Health) | - | 3(2) | - |
| Psychology 311 | Elementary Psychology | - | 3 | - |
| Psychology ___ | Business and Industrial Relations | - | - | 3 |
| | Electives | 3-5 | 3-4 | 0-3 |
| | | 16-18 | 17-19 | 16-18 |

### Manufacturing Major

| Second Year | | F | W | S |
|---|---|---|---|---|
| Manuf. Tech.___ | Manufacturing Cost Analysis | 4 | - | - |
| Manuf. Tech.___ | Production Scheduling | - | 3 | - |
| Manuf. Tech.___ | Methods Time Motion | - | 3 | - |
| Manuf. Tech.___ | Quality Control | - | - | 3 |
| Mech. Tech.___ | Strength of Materials | 4 | - | - |
| Mech. Tech.___ | Metallurgy* | - | 4 | - |
| Mech. Tech.___ | Plastics | - | - | 3 |
| Math ___ | Technical Statistics | 3 | - | - |
| Business___ | Technical Data Processing | 3 | - | - |

| **Second Year** | | F | W | S |
|---|---|---|---|---|
| English 411 | Technical Report Writing | - | - | 3 |
| Psychology 311 | Elementary Psychology | - | 3 | - |
| Psychology___ | Business and Industrial Relations | - | - | 3 |
| Health 114 (111) | First Aid (or Personal Health) | - | 3(2) | - |
| | Electives | 3-4 | - | 3-5 |
| | | 17-18 | 15-16 | 15-17 |

*High school chemistry (or equivalent) is a prerequisite to metallurgy.

NOTE: All numbered courses are courses we now offer. Those with a blank following the title are new courses which do not exist at present.

E. Student Admission Requirements

See section on Civil Engineering Technology.

F. Recommendations

1. The revision of the existing drafting and design program and the implementation of the manufacturing major under one mechanical technology program should be implemented with the following conditions:

   a. In the third building phase at Rochester State Junior College, space and funds should be committed for the necessary laboratories and equipment as stated in the revision. This would include additional equipment as follows:

| | Approximate Cost |
|---|---|
| Machine Tool | 75,000 |
| Strength of Materials | 40,000 |
| Metallurgy | 30,000 |
| | $145,000 |

It may be possible to combine the strength and materials laboratory with the metallurgy laboratory.

   b. The needed facilities and equipment for existing programs should be acquired before or concurrently with the implementation of a manufacturing technology major.
   c. The above laboratories should be properly equipped if the civil and drafting and design technology programs are to continue and if the proposed manufacturing technology program is to be implemented.
   d. With the implementation of a manufacturing major, an industrial engineer must be hired.

2. One instructor be designated as the lead or head instructor whose function would be to coordinate the entire mechanical technology program.
3. When a new program is to be implemented, the program director, or lead instructor, should be imployed one year before implementation of a new program in order to:
   a. Integrate existing courses and staff with new courses and staff and to assist in securing proper personnel.
   b. Requisition proper equipment and supplies.
   c. Set up and meet with the advisory committee for that program.
   d. Become familiar with the community and local industries.
   e. Possibly teach one course in a related field to become familiar with student needs and abilities.
4. A summer program should be provided that will enable a student to make up high school deficiencies before

entering a technology program.

5. A director of placement should be hired to service primarily the career areas. He should arrange job interviews for graduates and provide for continuing contact with graduates after they leave our college.
6. A public relations man should be employed to promote all phases of the college. Specifically, he should promote all occupational curricula in so far as working with high school students, counselors, parents and employers.
7. The library must be put on a planned program for expanding its holdings in the mechanical technology fields. Both books and periodicals are needed.
8. Adequate secretarial help should be provided.

## Electronics Technology

(with Medical Electronics Option)

## I. INVESTIGATIVE TECHNIQUES

### A. Consultants

1. Out-of-state

Arthur P. Carlson, Milwaukee Technical College
Joseph D. DePasquale, Erie County Technical Institute
Frederick W. Lamb, Flint Community Junior College
Robert L. Reid, Broome Technical Community College
Edwin J. Taibl, Milwaukee Technical College
Brian J. Trambley, Iowa State University
Richard H. Unger, Iowa State University
George S. Whitney, State University of New York at Alfred

2. Local

Irvin Zimmerman, Mayo Clinic
William Dunnette, Mayo Clinic
Dr. George W. Beeler, Mayo Clinic
Gerald Schultz, International Business Machines

### B. Investigative Trips

Broome Technical Community College, Binghamton, New York
Erie County Technical Institute, Buffalo, New York
Flint Community Junior College, Flint, Michigan
Henry Ford Community College, Dearborn, Michigan
Iowa State University, Ames, Iowa
Milwaukee Technical College, Milwaukee, Wisconsin
State University of New York at Alfred

### C. Materials Examined

In addition to examining the physical facilities of the institutions mentioned above, detailed outlines of the course descriptions were also studied. The following list includes selected documents which provided us with significant information:

Characteristics of Excellence in Engineering Technology Education (McGraw Report) published by the American Society for Engineering Education, 1962.

Evaluation Report of Technology Programs at Rochester State Junior College by the Engineering Technology

Committee, Engineers' Council for Professional Development, May 23, 1968.

Planning Report on Programs for Technicians in Minnesota A report to the Liason Committee for Higher Education from the planning sub-committee, December, 1964.

Survey of Technical Needs of Industry and Implications for Curriculum Development in Higher Education, Department of Industry and Technology, Northern Illinois University, Dekalb, Illinois, 1966.

## II. EVALUATION OF EXISTING PROGRAM

### A. Description of the occupation

The electronic engineering technology job cluster is concerned with application of scientific and engineering knowledge to immediate practical problems in research, development, manufacturing, testing, installation and maintenance of many products containing electronic parts. General occupational requirements involve a substantial theoretical education and practical background to provide job flexibility and opportunity for personal advancement.

Electronic engineering technicians render direct technical assistance to professional engineers and scientists. They are also employed in organized research activities as members of teams with engineers and scientists wherein the engineering technicians work principally in testing and development. In many instances, engineering technicians serve in supervisory positions over manufacturing or construction operations, coordinating and directing the work of skilled craftsman.

The technician in performing his job can expect to prepare and interpret engineering drawings and sketches; select, compile, and use technical information; analyze and interpret information obtained from precision measuring and recording instruments; assemble and test electronic components; write reports.

B. What are the manpower needs?

The results of a survey taken by the planning sub-committee of the Liason Committee for Higher Education, State of Minnesota, indicate that the current demand for electronic technicians exceeds by a substantial margin the number of technicians currently being produced in educational institutions in Minnesota. The survey also shows that 830 electronics technicians will be needed in Minnesota by 1970. Existing facilities are not adequate to meet this demand.

On a national level, the Bureau of Labor Statistics predicts a shortage of about 350,000 technicians in 1975 - approximately 34 percent of the net demand between now and then. This represents a cumulative deficit over the period between 1966 and 1975. In 1975 alone, we can anticipate only 57,000 technical institute graduates entering industry, as against a projected need for 130,000. This represents a deficit for that one year of approximately 56 percent between new supply and expected demand.

C. How are these needs currently being met?

These needs are not being adequately met at present. Although several state and private institutions now offer engineering level technology programs, none of which are ECPD accredited, the demand is far greater than the supply.

D. Description of the Curriculum

The functional needs of those in the area of electronic technology vary widely. In general, use of algebra, trigonometry, plane geometry and calculus are deemed necessary. In the area of physics, electricity and magnetism are viewed as essential, while the subject of mechanics is deemed advisable. Courses in AC circuits, DC circuits, basic electronics, circuit analysis, electronic instruments, communications, systems, fabrication, and technical drafting are viewed as being essential. Similar to other areas of technology, it is felt that the ability to analyze experimental data and to express this analysis in the form of technical writing is also advisable.

The present curriculum in electronics technology, though basically strong in most of the areas mentioned, reflects (1) a distinct weakness in the areas of communications, fabrication and systems, and (2) a strong orientation in computer design and operation.

## PRESENT CURRICULUM

### Freshman Year

| | | Credits | | |
|---|---|---|---|---|
| | | F | W | S |
| English 327-328 | Technical English | 3 | 3 | - |
| Speech 311 | Introduction to Speech | - | - | 3 |
| Tech. Math 314-315-316 | Math for Electronics | 5 | 5 | 5 |
| Tech. Science 314-315 | Technical Physics | - | 4 | 4 |
| Electronics 314 | D. C. Circuits | 5 | - | - |
| Electronics 315 | A. C. Circuits | - | 5 | - |
| Electronics 316 | Semiconductor Fundamentals | - | - | 5 |
| P.E. 101-102-103 | Physical Education | 1 | 1 | 1 |
| Engineering 311 | Orientation to Technology | 1 | - | - |
| | Electives | 3 | - | - |
| | | 18 | 18 | 18 |

### Sophomore Year

| | | Credits | | |
|---|---|---|---|---|
| | | F | W | S |
| Electronics 411 | Circuit Analysis | 3 | - | - |
| Electronics 414 | Industrial Electronics | 4 | - | - |
| Electronics 414L | Industrial Electronics Lab | 2 | - | - |

### Sophomore Year
(Continued)

| | | Credits | | |
|---|---|---|---|---|
| | | F | W | S |
| Electronics 415 | Computer Fundamentals | - | 5 | - |
| Electronics 415L | Computer Fundamentals Lab | - | 2 | - |
| Electronics 421 | Basic Instrumentation | - | 5 | - |
| Electronics 416 | Computer Systems | - | - | 5 |
| Electronics 416L | Computer Systems Lab | - | - | 2 |
| Electronics 422 | Electronics Design | - | - | 5 |
| Technical Science 316 | Technical Physics | 4 | - | - |
| English 411 | Technical Writing | - | - | 3 |
| Drawing 414-415 | Drafting for Electronics | 3 | 3 | - |
| Health 114 | First Aid | 3 | - | - |
| | Electives | - | 3 | 3 |
| | | 19 | 18 | 18 |

NOTE: A proposed revision of the curriculum is included in the section on recommendations.

## E. Student Admission Requirements

See Student Admission Requirements to Technology Programs in the section on Civil Engineering Technology.

## F. Facilities

1. Room: Adequate laboratory space is provided for the instruction of circuits, both A.C. and D.C., electronics, instrumentation, and elementary computers. If proposed revisions are approved, additional laboratory space will be needed.
2. Equipment and Supplies: The existing laboratory equipment is very ample to provide practical experiences in the areas mentioned above. Total value of existing equipment is approximately $70,000 with an additional $1,000 spent annually for supplies.
3. Staff: Two instructors comprise the present staff in electronics technology.

G. Special Problems

See Special Problems in section of Civil Engineering Technology.

H. Recommendations

1. Curriculum

An inspection of the present curriculum reveals that the following changes should be instituted in order to assure the possibility of providing a strong program in electronics technology. The proposed changes will also broaden the curriculum in electronics and, therefore, increase the employment opportunities of graduates.

a. Course titles Electronics 314 and Electronics 315 should be changed to Circuits I and Circuits II. The new course titles more appropriately represent the materials taught in these courses. In addition, Electronics 411 (circuit analysis) should be titled Circuits III and shifted from fall quarter of the second year to spring quarter of the first year. These changes will establish an uninterrupted sequence of circuits courses beginning with DC circuits in the fall and ending with circuit analysis in the spring of the freshman year.

b. Electronics 414 (Industrial Electronics) should be deleted as a course title. The content of this course will be included in the following courses:

(1) Systems I - Basic principles involved in control systems. Fundamental theory and operation of transducers for the measurement of temperature, pressure, flow, liquid level, and other physical

properties. Analysis of both electrical and mechancial devices most commonly used in industry.

(2) Systems II - Analysis of control systems. Study of practical control systems.

(3) Systems III - Basic Communications.

c. So that the student might be provided with a better understanding of fabrication principles, we recommend the implementation of the following one credit shop courses:

(1) Electronics Shop I - An introduction to shop techniques and tools, wiring and soldering techniques.

(2) Electronics Shop II - The mechanics and techniques of building and installing electronic equipment. Familiarization with the comparison of available parts and tools and their use. Maintenance and trouble-shooting of electronic equipment.

d. Proposed Program Revision in Electronics Technology.

### Freshman Year

| | | Credits | | |
|---|---|---|---|---|
| | | F | W | S |
| English 327-328 | Technical English | 3 | 3 | - |
| Math 317-318-316 | Technical Mathematics | 5 | 5 | 5 |
| Physics 315-316 | Technical Physics | - | 4 | 4 |
| E. Tech. 314 | Circuits I | 5 | - | - |
| E. Tech. 315 | Circuits II | - | 5 | - |
| E. Tech. 411 | Circuits III | - | - | 3 |
| E. Tech. 316 | Electronics I | - | - | 4 |
| E. Tech___ | Electronics Shop I | - | - | 1 |
| Engineering 311 | Orientation to Technology | 1 | - | - |
| P.E. 101-102-103 | Physical Education | 1 | 1 | 1 |
| | *Electives | 3 | - | - |
| | | 18 | 18 | 18 |

## Sophomore Year

| | | Credits | | |
|---|---|---|---|---|
| | | F | W | S |
| E. Tech. | Electronics Shop II | 1 | - | - |
| E. Tech. | Electronics II | 4 | - | - |
| E. Tech. | Electronics III | - | - | 5 |
| E. Tech. | Systems I | 4 | - | - |
| E. Tech. | Systems II | - | 4 | - |
| E. Tech. 415 | Computers I | - | 4 | - |
| E. Tech. 416 | Computers II | - | - | 4 |
| E. Tech. 421 | Basic Instrumentation | - | 4 | - |
| E. Tech. 422 | Electronics Design | - | - | 5 |
| Drawing 414-415 | Drafting for Electronics | 3 | 3 | - |
| English 411 | Technical Writing | - | - | 3 |
| Speech 311 | Introduction to Speech | 3 | - | - |
| Health 114 | First Aid | 3 | - | - |
| | *Electives | - | 3 | - |
| | | 18 | 18 | 17 |

*A minimum of six credits in social sciences must be earned in order to fulfill the college's general educational requirements.

e. A trailer sequence should be adopted that would include certain electronic technology courses. The trailer sequence would be a duplicate of the first year electronic technology program and would start at the beginning of winter quarter continuing through the spring and summer quarters. In this way, the late starter would have a chance to enter the program without having to be delayed one year. This sequence should also reduce the present attrition rate by providing a second chance for those students who fail fall quarter electronics courses.

2. Staff

a. In an effort to maintain an effective curriculum, the electronics curriculum should be placed directly under the guidance of a person completely aware of the positions acquired by electronic technicians and the fundamental training they must possess. It is further suggested that this person be given sufficient release time so that he might adequately perform his duties.

b. As new teachers are secured, emphasis should be placed on hiring persons with a combination of teaching experience and electrical engineering background.

3. Room and Equipment

To properly implement the systems and electronic shop courses, we recommend the addition of a systems instrumentation laboratory and a fabrication laboratory. Based on the report of an evaluation committee of the Engineers' Council for Professional Development dated May 1968, the cost of these laboratory facilities would be approximately $70,000. Of this amount, $20,000 would be needed for the fabrication laboratory.

4. Admissions and Recruitment

a. Promotional efforts with high schools in the area should be intensified to immediately increase student enrollment in all engineering technology programs.

b. Consideration should be given to establishing a pre-entrance program for students who wish to enter technology programs but who fail to meet entrance requirements. Strong emphasis in such a program should be placed on courses in mathematics and physics. Courses in English may be desirable.

## III. FEASIBILITY OF IMPLEMENTING A MEDICAL ELECTRONICS OPTION

### A. Description of Occupation

The medical electronics job cluster is concerned with the the design, development, maintenance, and operation of electronics equipment used and developed by medical facilities and industrial firms.

General occupational requirements involve an electronics and biological science background, a familiarity with design and fabrication processes.

After completing his course work, the graduate will be able to communicate with both the electrical engineer and the physician. He will understand problems encountered by both and be able to take ideas developed by either and translate them into actual working equipment. He will be able to give this equipment both routine service and fundamental maintenance. He may also give occasional suggestions for improvement in design of such equipment.

### B. Manpower Needs

Medical electronics is a new and demanding field. Because of the increased use of electronic systems in medical equipment, technicians are now being hired by the medical industry in the biological science aspects of their job. Conversely, those trained in the sciences have to be further educated in electronics. An ideal solution to this problem of re-training is clearly a technician trained in both areas.

### C. How are these needs currently being met?

Manpower needs are currently supplied by electronic technicians from two-year degree programs and non-graduate persons with a technical background and keen logic ability.

Sophomore Year

| | | Credits | | |
|---|---|---|---|---|
| | | F | W | S |
| E. Tech. ___ | Electronics Shop II | 1 | - | - |
| Drawing 414, 415 | Drafting for Electronics | 3 | 3 | - |
| Speech 311 | Introduction to Speech | 3 | - | - |
| Bio. Science ___ | Anatomy and Physiology | 3 | 3 | - |
| E. Tech. 415 | Computers I | - | 4 | - |
| E. Tech. 416 | Computers II | - | - | 4 |
| E. Tech. 421 | Basic Instrumentation | - | 5 | - |
| E. Tech. 422 | Electronics Design | - | - | 5 |
| English 411 | Technical Writing | - | - | 3 |
| Health 114 | First Aid | - | - | 3 |
| E. Tech. __ | Systems I | 4 | - | - |
| E. Tech. __ | Systems IIA | - | 4 | - |
| | *Electives | 3 | - | - |
| | | 17 | 19 | 15 |

*A minimum of six credits in social sciences must be earned to fulfill the college's general educational requirements.

E. Student Admission Requirements

See Student Admission Requirements to Technology Programs in the section on Civil Engineering Technology.

F. Costs

1. Room - The facilities as proposed for the electronics technology program should be adequate for medical electronics.
2. Equipment - A simulator for bio-medical application would justify the equipment differences between Electronics Technology and Medical Electronics.
3. Staff - Teaching staff should have a combination teaching experience and electrical engineering background.

## G. Special Problems

The technician market in the medical electronics field per se is competitive in starting salaries. However, hospitals and clinics have not elevated their starting salaries to be competitive with other electronic technician oriented jobs.

## H. Recommendations

1. It is recommended that the Medical Electronics offerings be implemented only if the following two conditions are met first:
    a. The recommendations for the electronics technician program have been implemented.
    b. Enrollment in the electronics technology program is sufficient to justify the medical electronics offerings.
2. The Medical Electronics offerings should be implemented as a sophomore option in the Electronics Technology Program.

# Health - Related Technologies

- LABORATORY TECHNOLOGY
  Revised to:
  CLINICAL LABORATORY TECHNOLOGY
- PSYCHIATRIC TECHNOLOGY
- NURSING
- X-RAY TECHNOLOGY

Subcommittee
Lyle V. Madsen
Gordon R. Meyers
James M. Russell
Jerry C. Tammen

# Laboratory Technology

(revised to Clinical Laboratory Technology)

## I. INVESTIGATIVE TECHNIQUES:

### A. Consultants:

1. Out-of-state

Dr. J. Lynn Arbogast, Indiana University
Dr. Harry E. Davis, Forest Park Community College
Dr. Oliver H. Duggins, Forest Park Community College
Dr. Raymond A. Pietak, Forest Park Community College

2. Local

| | |
|---|---|
| Mr. Russell Hanson, | Administrative Associate, Mayo Clinic Graduate School of Medicine |
| Mr. George Kraft, | Personnel Training Coordinator, Mayo Clinic Graduate School of Medicine |
| Mr. Dean Larson, | Administrative Assistant, Mayo Clinic |
| Dr. Gerald Needham, | Mayo Foundation Medical Education Staff |

### B. Investigative Trips:

1. Forest Park Community College, St. Louis, Missouri
2. University Medical Center, Indianapolis, Indiana

### C. Materials Examined:

The program at Rochester State Junior College was examined as were the programs of various institutions at both the state and national levels. Reading material describing program content at these institutions was examined along with the physical facilities themselves.

## II. EVALUATION OF EXISTING PROGRAM:

### A. Description of the occupation:

Modern laboratory methods and procedures require the services of personnel with a comprehensive training in the physical and biological sciences. The laboratory technologist serves as support personnel for the physician or engineer by performing qualitative and quantitative tests in the laboratory.

B. What are the manpower needs?

Local manpower needs for the Mayo Clinic alone are estimated at 20 laboratory technologists per year according to the Clinic's personnel director. However, according to a study made by the St. Louis Junior College District, on a statewide or national basis there exists an accute shortage of qualified personnel in this job classification.

C. How are these needs currently being met?

Current needs are not being met by the supply of qualified personnel. Therefore, laboratories are forced to employ non-trained personnel and train the employees on the job, according to local medical officials. This not only involves cost in training but also results in a lack of theoretical background which would allow the technologist more insight into his work.

D. Description of the curriculum:

The program is designed to provide basic knowledge and techniques for success in laboratory work concerned with biological, chemical, or physical determinations. Graduates of this course of study should also be in an excellent position to continue their studies in medicine or other professional scientific fields.

CURRICULUM OUTLINE FOR LABORATORY TECHNOLOGY

Freshman Year

| | | CREDITS | | |
|---|---|---|---|---|
| | | F | W | S |
| English 127-128-129 or | Reading Analysis and Composition or | 5 or | 5 or | 5 or |
| English 117-118-119 | Freshman English | 4 | 4 | 4 |
| Chemistry 124-125 | General Inorganic Chemistry | 5 | 5 | ... |

| | | CREDITS | | |
|---|---|---|---|---|
| | | F | W | S |
| Bio. Science 127-128-133 | Zoology | 5 | 5 | 5 |
| Chemistry 126 | Semi-micro Qualitative Analysis | ... | ... | 5 |
| Mathematics 114 | College Algebra* | ... | 5 | ... |
| Mathematics 115 | Trigonometry | ... | ... | 5 |
| Phy. Ed. 101-102-103 | General Physical Education | 1 | 1 | 1 |
| | College Orientation | ... | ... | ... |
| | Electives | 3 | ... | ... |
| | | 18 | 18-20 | 19-21 |

Sophomore Year

| | | CREDITS | | |
|---|---|---|---|---|
| | | F | W | S |
| Chemistry 221 | Quantitative Analysis | 4 | ... | ... |
| Chemistry 224-225 | Organic Chemistry | ... | 4 | 4 |
| Physics 134-135-136 | General Physics | 5 | 5 | 5 |
| | Social Science | 3-5 | 3-5 | 3-5 |
| Health 111 | Personal Health | 2 or | 2 or | 2 or |
| | Electives | 1-4 | 1-4 | 1-4 |
| | | 15 | 15 | 15 |

*Higher Albebra is a prerequisite and must be taken in the fall quarter if not taken in high school.

E. Student Admission Requirements:

A student entering the program must be a high school graduate. Courses in high school chemistry, biology, physics, and mathematics through higher algebra are strongly recommended.

F. Costs:

1. Room:

This program is now being offered at the college and enrolls about six to ten students per year. There are no courses which are specific to this program. As a result, the students utilize the classroom space and laboratories which are shared with students from other programs.

2. Equipment:

The special equipment used by students in this program is also used by students in other science-oriented programs. Chemistry, physics, and biology laboratories are presently equipped for satisfactory general laboratory instruction. There is, however, a shortage of analytical equipment in all three fields, the lack of which would make applied clinical instruction very difficult.

3. Staff:

On the basis of a 22 to 1 ratio of students to faculty members, ten students represent the following in staff costs: 10/22 or 0.45 instructors per year (approx. $4,000) or for the two-year program approximately $8,000.

4. Supplies:

The training of the student who is heavily involved in science courses is more costly to the college than those in non-laboratory courses. The biology department estimates a supply cost of $5.40 per student per biology course. Although physics and chemistry would probably be less costly, the difference would probably not be significant. Since no breakage fees are charged, these costs are absorbed by the college. At present, the six students in the program would each complete twelve laboratory courses in the sciences. Assuming a cost of $5.40 per student per course for expendable supplies, the cost of supplies for science courses alone become about $64.80 per student. The cost of supplies for other courses then must be added to this figure.

G. Special Problems:

The laboratory technology program presently offered shows a complete lack of applied clinical training in the medical laboratory. In addition, the theoretical background in the laboratory sciences is so rigorous that successful completion of these courses actually is almost identical with pre-medical technology or pre-medicine requirements. A student who can succeed in this level of course work is capable of professional training beyond this level and in very few cases terminates his training after two years to take a position as a laboratory technician.

The difficulty of the courses causes the attrition of the very students who form the pool of manpower needed for this job classification.

H. Recommendations:

1. Due to the special problems discussed above, it is recommended that the present program in laboratory technology be discontinued. Students desirous of this background may obtain the same degree and type of training through the pre-medical technology program.
2. It is further recommended that a new program, clinical laboratory technology, be implemented at the college. This new program should be less rigorous academically with emphasis placed upon increased applied training in local medical institutions. The program design should qualify graduates to obtain national registration.
3. Refer to Part III for our detailed recommendations for implementation of a new program in Clinical Laboratory Technology.

## III. FEASIBILITY OF IMPLEMENTING A PROGRAM IN CLINICAL LABORATORY TECHNOLOGY

### A. Description of the occupation:

Under the supervision of a medical technologist, the clinical laboratory technician performs qualitative tests and related duties characteristic of the laboratory in which he works. In some laboratories, the technician is expected to be familiar with the work performed in each department. In other instances, he might specialize in one department such as bacteriology, blood bank, or serology. The degree of specialization depends on the size of the laboratory, the volume of tests, or the use of automated equipment.

### B. What are the manpower needs?

Consultation with local medical officials indicates a continued need for about twenty or more laboratory technicians per year. The Junior College District of St. Louis states that national studies indicate that by 1975 there will be a need for approximately 90,000 laboratory technicians. It is anticipated that with the increased medical services which have been recently offered to the aged and with the increased complexity of laboratory diagnostic procedures, that the shortage of qualified laboratory technicians will become more acute in the near future.

### C. How are these needs currently being met?

Local personnel directors indicate the inability to fill laboratory technician positions with trained personnel; consequently, high school graduates are given a minimal degree of on-the-job training. Locally, the greatest needs are at the

Mayo Clinic and the hospitals. It is anticipated that with the quality of clinical facilities in a medical center such as Rochester the trainee would become familiar with highly specialized diagnostic procedures. This should make our laboratory technician able to compete very favorably in the national manpower market.

### D. Description of the Proposed Curriculum:

The Rochester State Junior College degree program prepares potential clinical technologists to perform in a modern medical laboratory under the jurisdiction of a medical technologist or a pathologist. The program is designed with the intent that the student receives an understanding of basic theory and applied science in the many special procedures performed in the medical laboratory. Satisfactory performance in these skills is achieved through experiences in college laboratories and co-operating clinics.

## Proposed Program in:

## CLINICAL LABORATORY TECHNOLOGY

| Freshman Year | | Credits | | |
|---|---|---|---|---|
| | | F | W | S |
| English 117, 118, 119 | Freshman English | 4 | 4 | 4 |
| Phy. Ed. 101, 102, 103 | General Physical Education | 1 | 1 | 1 |
| Bio. Science 117, 118, 119 | Anatomy and Physiology | 3 | 3 | 3 |
| Bio. Science 121 | General Microbiology | - | - | 5 |
| Health 111 | Personal Health | - | 2 | - |
| Psychology 214, 215 | General Psychology | 3 | 3 | - |
| Chemistry 114, 115 | General Chemistry | - | 5 | 5 |
| *Mathematics 317 | Technical Mathematics | 5 | - | - |
| | | 16 | 18 | 18 |

*Students with a grade of C or above in high school algebra are permitted to enroll in Math 317. If grade is lower than a C, or if algebra has not been taken in high school, Math III must be taken as a prerequisite.

*Sophomore Year

| | Credits | | |
|---|---|---|---|
| | F | W | S |
| Bacteriology, Parasitology, Serology | 6 | - | - |
| Basal Metabolism & Electrocardiography | - | - | 2 |
| Orientation to Medical Laboratory | 2 | - | - |
| Hermatology | 6 | - | - |
| Clinical Practice I | - | 9 | - |
| Clinical Chemistry | - | 6 | - |
| Clinical Practice II | - | - | 9 |
| Routine Analysis | 4 | - | - |
| Blood Bank | - | - | 4 |
| | 18 | 15 | 15 |

*All courses recommended for the sophomore year are not presently offered at the college.

E. Student Admission Requirements:

The applicant for the Clinical Laboratory Technician program must have a high school diploma or its equivalency. The prospective student must have taken biology, chemistry, algebra, and geometry in high school or in college before entering the program. It is also highly desirable that he have background in higher algebra.

F. Costs:

A consultation with Mayo Clinic personnel--Dr. Gerald Needham Co-ordinating Director of Allied Health, Dean Larson, Personnel Officer, and others--was held on July 5, 1968, concerning the Clinic's willingness to act as a co-operating institution in the implementation of both a Clinical Laboratory Technology program and an X-ray Technology program; however, before firm position is taken by the Mayo Clinic, Rochester State Junior College must submit a program of studies to expert clinicians for their assessment regarding time and costs necessary for the implementation of such programs. Therefore, it is impossible at this time to calculate the anticipated costs of the respective programs until there is a greater degree of commitment on the part of the Mayo Clinic. When and if such a commitment is obtained, a dialogue should develop which will spell out what equipment will be furnished by us and what equipment will be furnished by the co-operating institution; what courses will be taught by us and what will be taught by the Clinic, etc. We would also have to determine whether Mayo personnel would teach at our facilities or at theirs. These are costly determinations which cannot be made at this time. In addition, until a close dialogue has developed, it is not possible to estimate the numbers of students who could be involved in such programs.

G. Special Problems:

The implementation of allied health programs has been determined to be a very costly process. The exact costs or even a reasonably accurate estimate of the implementation would depend on the amount of participation of the local medical institutions in the clinical training.

The participation of the medical institutions is essential to implementing the program. There can be no semblance of quality to the program without the clinical training, and, furthermore, the program will fail to meet the standards of the American Medical Association. This situation would result in a failure of the program to be accredited.

Since the college portion of the training is so interdependent with the hospital training, the institutions involved must have a sincere commitment toward cooperating in the offering of a quality program. Contracts should exist between the cooperating institutions which accurately describe the instructional roles of the institutions and any financial obligations which are a part of the instructional costs.

Recruiting of able students appears to be a problem in this area of allied health. More emphasis must be placed on making the high school student aware of the opportunities in this vocation. In addition to selecting students who are of acceptable academic ability, considerable emphasis should be placed on the emotional stability of the individual as well as his ability to deal with the sick or injured.

H. Recommendations:

The planning which is a prerequisite to the implementation of allied health programs dictates a rate of progress which is at best less than rapid. Nevertheless, at this writing the committee is optimistic that the program can and will succeed if the college and medical institutions can form a cooperative union. Such a union must be established before further planning in the allied health fields proceeds.

It is therefore recommended by this committee that the following procedure be followed to continue this study and eventually culminate in a conclusion on the merits of offering courses of study in the allied health areas:

1. Establish liaison contact with the Mayo Foundation for further study of the programs.

2. Determine the degree of commitment which the Mayo Foundation is willing to make toward the specific program.
3. Establish the content and sequence of clinical course offerings, utilizing expert assistance from the Mayo staff.
4. Establish an accurate estimate of the costs to the Mayo Foundation and to the Junior College in implementing the program initially and also in its continuance.

# Nursing

## I. INVESTIGATIVE TECHNIQUES

Considering the fact that the nursing program was adopted during the past academic year for implementation in the fall of 1968, this committee relied upon the data gathered by the College Ad Hoc Committee for Development of Associate Degree Nursing Program which was submitted to the Faculty Senate for approval. This committee felt that since the above mentioned information is current and thorough, it would be unnecessary duplication of effort on our part to look elsewhere for data in regard to costs and special problems. Local hospital officials were contacted in reference to personnel needs.

## II. EVALUATION OF EXISTING PROGRAM:

### A. Description of the occupation:

Nursing care plays a major role in the treatment of persons who are ill. Registered professional nurses administer medications and treatments prescribed by physicians; observe, evaluate, and record symptoms, reactions, and progress of patients; assist in education and rehabilitation of patients and improve their physical and emotional environment; instruct auxiliary personnel or students; and perform other duties concerned with the care of the sick and the injured, with the prevention of illness, and with the promotion of good health.

### B. What are the manpower needs?

According to the statistics of the United States Department of Labor's Occupational Outlook Handbook for 1966-67, there will be an increased demand for registered nurses at least through the mid-1970's. The increase in demand will be due to the following factors:

1. Growing population with greater proportion of very young and elderly people.
2. Improved economic status of the population.
3. Extension of prepayment programs for hospitalization and medical care.
4. Expansion of medical services as a result of new medical techniques and drugs.
5. Increased interest in preventative medicine and rehabilitation of the handicapped.

In addition to the vacancies existing as new positions, several thousand nurses are needed annually to replace those who leave the field each year because of marriage and family responsibilities. The anticipated increase in demand for professional nurses is expected to be accompanied by a rapid increase in the number of nursing graduates and in a return to work of some presently inactive nurses. Nevertheless, the demand for professional nurses is expected to be greater than the supply through the mid-1970's.

Statistics at the local level support the information in regards to national needs; for example, St. Mary's Hospital has a total staff of 415 Registered Nurses, and with an annual turnover of 40%, 166 new nurses are needed each year. The Rochester State Hospital indicated that to be properly staffed it would need 130 full-time Registered Nurses, but at the present time employs 62 nurses, of which 16 are part time.

Methodist-Kahler Hospital, which employs a total of 350 Registered Nurses, needs approximately 200 nurses annually.

Apparently the opportunities for nurses are unlimited.

C. How are these needs currently being met?

Up to the present time the needs have been met by various local training institutions; however, these have not kept pace with demands, and Rochester State Junior College has absorbed the function of both Methodist-Kahler School of Nursing and St. Mary's School of Nursing with facilities for potential growth.

D. Description of the curriculum:

Nursing education in a two-year college-centered program includes general education and some nursing theory classes on campus where the nursing student shares many learning experiences and activities with other college students. Clinical classes under the Rochester State Junior College supervision are conducted in local hospitals. For some students in maternal-child care the five-week summer session between the two academic years will be held at either St. Paul or Minneapolis.

CURRICULUM OUTLINE

| | | CREDITS | | | |
|---|---|---|---|---|---|
| Freshman Year | | F | W | S | S |
| Biological Science 117, 118, 119 | Anatomy and Physiology | 3 | 3 | 3 | - |
| Chemistry 114, 115 | General Chemistry | 5 | 5 | - | - |
| Psychology 226 | Developmental Psychology | - | - | 3 | - |
| Biological Science 121 | General Microbiology | - | - | 5 | - |
| Psychology 214, 215 | General Psychology | 3 | 3 | - | - |
| Nursing 101, 102, 103 | Nursing Theory | 3 | 3 | 3 | - |

| | | CREDITS | | | |
|---|---|---|---|---|---|
| | | F | W | S | S |
| Nursing 111, 112, 113 | Nursing Lab | 2 | 3 | 3 | - |
| Nursing 204 | Nursing A Theory | - | - | - | 4 |
| Nursing 214 | Nursing A Lab | - | - | - | 4 |
| | | 16 | 17 | 17 | 8 |

Sophomore Year
*Nursing B, C, D offered each quarter

| | | CREDITS | | | |
|---|---|---|---|---|---|
| | | F | W | S | S |
| | Electives (Humanities) | - | 3 | 5 | - |
| English 117, 118, 119 | Freshman English | 4 | 4 | 4 | - |
| Health 114 | First Aid | - | 3 | - | - |
| Physical Educ. 101, 102, 103 | General Physical Ed. | 1 | 1 | 1 | - |
| Sociology 114 | Man in Society | 3 | - | - | - |
| *Nursing 205 | Nursing B Theory | 3 | - | - | - |
| Nursing 215 | Nursing B Lab | 5 | - | - | - |
| Nursing 206 | Nursing C Theory | - | 3 | - | - |
| Nursing 216, 226 | Nursing C Lab | - | 5 | - | - |
| Nursing 207 | Nursing D Theory | - | - | 3 | - |
| Nursing 217 | Nursing D Lab | - | - | 5 | - |
| | | 16 | 19 | 18 | 0 |

NOTE: Numbers for nursing courses as listed above are tentative.

E. Student Admission Requirements:

Students must be graduates of an accredited high school and qualify for admission to the college. There are no age limitations. Since the basic sciences provide an essential background for nursing, it is recommended that the following courses be completed in high school:

Algebra, chemistry, biology, and physics.

Results of the scores on the ACT (American College Test) must be furnished to the college. Applicants living within a reasonable distance from the college will have a personal interview.

F. Costs:

See Appendix I (pp 57- 67) for cost of nursing program as estimated by the Ad Hoc Committee for the Development of the Associate Degree Nursing Program.

G. Special Problems:

See Appendix II (pp 68-70)

H. Recommendations:

In as much as this program has not yet been implemented, it is the opinion of this group that any recommendations concerning modifying it would be premature. A more appropriate time to make a reappraisal of this program would be after it has graduated its first class.

APPENDIX I.

Nursing Staff Summary (From appointment of Director through graduation of the first class)

**1967-68**

| | | |
|---|---|---|
| Director of Nursing | $15,000 (11 mo.) | $15,000 |
| | TOTAL | $15,000 |

**1968-69**

| | | |
|---|---|---|
| Director of Nursing | $15,000 (11 mo.) | $15,000 |
| Instructors - 7.5 | 8,500 @ | 63,750 |
| | TOTAL | $78,750 |

**1969 Summer**

| | | |
|---|---|---|
| Director of Nursing | --- | --- |
| Instructors - 19 | $ 1,200 @ | $32,800 |
| | TOTAL | $32,800 |

**1967-70**

| | | |
|---|---|---|
| Director of Nursing | $15,000 (11 mo.) | $15,000 |
| Instructors - 16.5 | 8,500 @ | $140,250 |
| | TOTAL | $155,250 |

Academic Staff

First Year (225 Freshman) (1968-69)

36 academic credits x 225 students = 8,100 credit hours per year.

Instructor teaches 45 credits per year of 20 students each = 900.

8,000 ÷ 900 = 9 instructors.

Summer Session

None

Second Year (225 freshman - 180 sophomores) (1969-70)

19 academic credits x 180 students = 3,420 credit hours per year.

Instructor teaches 45 credits per year of 20 students each = 900.

3,420 ÷ 900 = 3.8 instructors.

Supporting Staff

First Year (225 students) (1968-69)

These students are not being serviced presently by supporting staff since these services are provided by the schools of Nursing.

Counseling - 1

Librarian - ½

Financial Aids & Placement - ½

Clerk-Typist - 2

Summer Session

None

Second Year (225 freshman - 180 sophomores) (1969-70)
(additions required because of addition of sophomore class)

Counseling - ½

Librarian - ½

Financial Aids & Placement - ½

Clerk-Typist - 1

## Academic Staff Summary

### 1967-68

None

### 1968-69

| | | |
|---|---|---|
| Instructors - 9 | $8,500 @ | ($76,500) |
| *(Present staff = 7.2) | | |
| Net addition = 1.8 | $8,500 @ | $15,300 |

### Summer Session 1969

None

### 1969-70

| | | |
|---|---|---|
| Instructors 5.6 | $8,500 @ | $47,600 |
| | | $62,900 |

## Supporting Staff

### 1967-68

None

### 1968-69

| | | |
|---|---|---|
| Counselor - 1 (10 mo.) | $9,500 @ | $ 9,500 |
| Librarian - ½ (10 mo.) | $4,750 @ | $ 4,750 |
| Financial Aids & Placement - ½ (10 mo.) | $4,750 @ | $ 4,750 |
| Clerk-Typist - 2 (12 mo.) | $3,500 @ | $ 7,000 |
| | | $26,000 |

### Summer Session 1969

None

### 1969-70

| | | |
|---|---|---|
| Counselor - 1½ (10 mo.) | $9,500 @ | $14,250 |
| Librarian - 1 (10 mo.) | $9,500 @ | $ 9,500 |
| Financial Aids & Placement - 1 (10 mo.) | $9,500 @ | $ 9,500 |
| Clerk-Typist - 3 (12 mo.) | $3,500 @ | $10,500 |
| | | $43,750 |

Total Staff Needs - Summary *[2]

1967-68

| | | |
|---|---|---|
| Director of Nursing | $15,000 (11 mo.) | $ 15,000 |
| | TOTAL | $ 15,000 |

1968-69

| | | |
|---|---|---|
| Director of Nursing | $15,000 (11 mo.) | $ 15,000 |
| Nursing Instructors - 7.5 | $ 8,500 @ | $ 63,750 |
| *[1]Academic Instructors (net addition) - 1.8 | $ 8,500 @ | $ 15,300 |
| Supporting Staff | | $ 26,000 |
| | TOTAL | $120,750 |

1969 Summer

| | | |
|---|---|---|
| Nursing Instructors - 19 | $ 1,200 @ | $ 32,800 |
| | TOTAL | $ 32,800 |

1969-70

| | | |
|---|---|---|
| Director of Nursing | $15,000 (11 mo.) | $ 15,000 |
| Nursing Instructors - 16.5 | $ 8,500 @ | $140,240 |
| Academic Instructors - 5.6 | $ 8,500 @ | $ 47,600 |
| Supporting Staff | | $ 43,750 |
| | TOTAL | $236,590 |

*[1] See Supplement 1 (Page 61)

*[2] See Supplement 2 (Page 61)

## Supplement 1 - Present Enrollment & Credits of Nursing Students.

St. Marys - 44 credits x 90 students = 3,960 credit hours per year.

Methodist-Kahler - 32 credits x 80 students = 2,560 credit hours per year.

6,520 credit hours per year

Instructor teaches 45 credits per year of 20 students each = 900

6,520 ÷ 900 = 7.2 present instructors.

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## AA Program - Projected Requirement for Academic Instructors

55 credit academic x 225 students = 12,375 credit hours per year.

Instructor teaches 45 credits per year of 20 students each = 900

12,375 ÷ 900 = 13.65 instructors required.

---

## Supplement 2 - Estimated Instructor Needs Based on FTE & Ratio

### 1969-70

FTE in Nursing should exceed present nursing FTE by approximately 250.

Half at 20-1 = 6 instructors

Half at 10-1 =12 instructors

TOTAL 18 instructors

Equipment, Supplies *, Travel

1967-68

| | |
|---|---|
| Director of Nursing - Office Equipment | $ 500.00 |
| Director of Nursing - Travel | $ 2,000.00 |
| Director of Nursing - Secretarial Assistant | $ 500.00 |
| Director of Nursing - Program Publicity | $ 1,500.00 |
| TOTAL | $ 4,500.00 |

1968-69

| | |
|---|---|
| Director of Nursing - Travel | $ 500.00 |
| Director of Nursing - Secretarial Assistant | $ 500.00 |
| Director of Nursing - Program Publicity | $ 1,500.00 |
| Instructors - Office Equipment | $ 4,500.00 |
| Hospital Room Demonstration Equipment | $ 2,400.00 |
| Additional Microbiology Equipment | $ 7,200.00 |
| Additional Anatomy & Physiology Equipment | $ 5,200.00 |
| Additional Chemistry Equipment | $ 2,200.00 |
| Special A-V Equipment & Teaching Aids | $10,000.00 |
| Library Materials | $10,000.00 |
| TOTAL | $44,000.00 |

Summer 1969

None

1969-70

| | |
|---|---|
| Director of Nursing - Travel | $ 500.00 |
| Director of Nursing - Secretarial Assistance | $ 500.00 |
| Director of Nursing - Program Publicity | $ 1,500.00 |
| Instructor Office Equipment | $ 6,500.00 |
| A-V & Teaching Aids | $ 5,000.00 |
| Library Materials | $10,000.00 |
| TOTAL | $24,000.00 |

(*Request assumes teaching supplies will come from formula appropriation.)

## Space Requirements

1. At the college no specialized teaching facilities will be required which are not presently projected in phase I and phase II of construction.
2. In 1968-69 an additional 55 nursing students will need to be accomodated in junior college classes over what we presently serve. It is expected that this can be accomplished.
3. In 1969-70 an additional 180 nursing students will need to be accommodated. Completion of Phase II of construction should permit this to be accomplished. If this is not accomplished, classrooms in the hospitals are available on a temporary basis.
4. Contracts with "affiliated institutions" will provide space for conference and seminar rooms, at no cost to the college.

# SUMMARY OF PROGRAM COSTS

## 1967-68

| | | |
|---|---|---|
| Nursing Staff | | $ 15,000.00 |
| Academic Staff | | ------- |
| Equipment, Supplies, Travel | | $ 4,500.00 |
| | TOTAL | $ 19,500.00 |

## 1968-69

| | | |
|---|---|---|
| Nursing Staff | | $ 78,750.00 |
| *Academic Staff | | $ 15,300.00 |
| Supporting Staff | | $ 26,000.00 |
| Equipment, Supplies, Travel | | $ 44,000.00 |
| | TOTAL | $164,050.00 |

## Summer 1969

| | | |
|---|---|---|
| Nursing Staff | | $ 32,800.00 |

## 1969-70

| | | |
|---|---|---|
| Nursing Staff | | $155,250.00 |
| *Academic Staff | | $ 47,600.00 |
| Supporting Staff | | $ 43,750.00 |
| Equipment, Supplies, Travel | | $ 24,000.00 |
| | TOTAL | $270,600.00 |

*Does not include present academic staff teaching nursing students.

| Year | Estimated Program Cost | Estimated Regular Program Allotments* | Requested Special Allotments |
|---|---|---|---|
| 1967-68 (no students) | $19,500.00 | ---- | $19,500.00 |
|  | TOTAL | ---- | $19,500.00 |
| 1968-69 (225 students) | $164,050.00 | Nursing Instructors<br>10-1 ratio<br>$78,750.00 |  |
|  |  | Academic Instructors<br>20-1 ratio<br>$15,300.00 |  |
|  |  | Supporting Staff<br>Off ratio | $26,000.00 |
|  |  | Equipment, Supplies<br>Travel<br>$ 4,000.00 | $40,000.00 |
|  | TOTAL | $98,050.00 | $66,000.00 |
| 1969 Summer (190 students) | $32,800.00 | Nursing Instructors<br>10-1 ratio<br>$32,800.00 | ---- |
|  | TOTAL | $32,800.00 | ---- |
| 1969-70 (405 students) | $270,600.00 | Nursing Instructors<br>10-1 ratio<br>$155,240.00 | ---- |
|  |  | Academic instructors<br>20-1 ratio<br>$47,600.00 | ---- |
|  |  | Supporting Staff<br>Off ratio<br>$17,000.00 | $26,750.00 |
|  |  | Equipment, Supplies, Travel<br>$13,900.00 | $10,100.00 |
|  | TOTAL | $233,740.00 | $36,850.00 |

It should be noted that approximately one-fourth of the educational cost of this program is recovered through tuition receipts.

### Requested Special Allotment Above Regular Formula Allocations from State Junior College Board Needed in Order to Initiate ADN Program at Rochester State Junior College.

| | |
|---|---|
| 1967-68 | $19,500 |
| 1968-69 | $66,000 |
| 1969 Summer | None |
| 1969-79 | $36,850 |

A. The Associate Degree nursing program being offered for the first time by the Junior College in 1968 will replace two local diploma programs offered at St. Mary's Hospital and Methodist Hospital.

Serious consideration will need to be given to students completing diploma programs in 1969 and 1970 relative to their eligibility for the AA degree. This decision must be made by the junior college administration and faculty.

B. It is understood that the junior college will have complete freedom in employing instructors for this program. However, every consideration will be given to employing qualified persons from the existing diploma programs. In the event that there are equally qualified applicants for staff vacancies, preference will be given to employees of the existing diploma schools.

C. Qualifications and selection of the director of this nursing program will be determined by the junior college in consultation with the Directors of existing programs and the State Junior College Board Office. Experience in directing an AA Nursing program is a highly desirable qualification for the Director of this proposed program.

D. One of the duties of the Director of Nursing and Junior College Administration will be the arrangement of written agreements with affiliated institutions. Assurance of complete cooperation of the Methodist Hospital, St. Marys Hospital, Community Hospitals, and State Hospital has been given.

E. At the appropriate time the advisability of seeking NLN accreditation of the program will be studied carefully.

F. The assistance of the professional nursing organizations will be solicited in establishing and supporting this nursing program.

G. At the present time the Mayo Clinic provides free health care for students in the diploma programs. Provisions for continuance or changes in this service for the students in the A.A. Nursing program will need early and careful study.

H. State and Federal Student Financial Aids services for nursing students will need to be assumed by the Junior College Financial Aids staff. The establishment of Scholarships for Nurses will need to be encouraged.

I. Transportation of students in the nursing program will need to be provided between the college campus and affiliated institutions. Serious consideration should be given by the State Junior College Board for provision of adequate funds to provide the necessary bus service.

## Tentative Calendar for Initiating Program

April 11, 1967 - Inform faculties of 3 institutions that proposal is being prepared.

April 15, 1967 - Proposal Completed

April 18, 1967 - Proposal approved by Hospital Administration, Dean of College and Junior College Advisory Committee.

April 25, 1967 - Obtain approval of proposal from State Junior College Board Office.

May, 1967 - Notify students in existing programs and alumni of initiation of new program.

May, 1967 - News Release to Media concerning new program.

May, 1967 - Insert proper information in institutional catalogs regarding program.

May, 1967 - Have local advisory committee officially appoint Nursing Advisory Committee.

May, 1967 - List vacancy for position as Director of Nursing.

July 1, 1967 - Employ Director of Nursing.

July-October, 1967 - Prepare Curriculum for Program.

Prepare Publicity for Program.

Prepare Staff needs for Program.

Sept. 1967-March 1968 - Prepare agreements with affiliated Institutions.

Recruit and interview student applicants.

November 1967-March 1968 - Recruit and employ staff

April-May, 1968 - Prepare teaching assignments and student schedules.

June, July 1968 - Prepare student and faculty orientation program, and trouble shoot.

September, 1968 - Freshman Nursing Program begins.

## I. INVESTIGATIVE TECHNIQUES

### A. Consultants

Dean Larson, Administrative Assistant, Mayo Clinic
Dr. Frank Tyce, Chief Administration Officer, Rochester State Hospital
Mr. Jerry Campbell, R.M., Director of Education, Rochester State Hospital

## II. FEASIBILITY OF IMPLEMENTING A PROGRAM IN PSYCHIATRIC TECHNOLOGY

### A. Description of the Occupation

A psychiatric technician is expected to perform tasks requiring greater skills than those of a hospital orderly and somewhat less than those of a Registered Nurse. Some emphasis should be placed upon the physical skills associated with hospital care; however, the primary emphasis should be upon caring for the emotional and psychological needs of the patient.

### B. What are the manpower needs?

In view of the medical nature of our community, the need for trained personnel in the psychiatric fields is constant. A Citizen's Advisory Committee for an area vocational school, Rochester, Minnesota, stated that locally an average of fifty psychiatric technician trainees are prepared per year as nurses' service personnel.

### C. How are these needs currently being met?

Local institutions are currently meeting their own needs through in-service training programs. For example, Rochester State Hospital has a six-month training program which includes 178 hours of classroom and clinical work.

D. Description of the proposed curriculum: See recommendations

E. Student admission requirements: Not applicable

F. Costs: See recommendations

G. Special Problems: See recommendations

H. Recommendations:

We do not recommend the implementation of this program for the following reasons:

1. Our school cannot compete with local medical institutions in attracting students, nor would it be able to compete effectively with a short-term trainee program (i.e. six months) such as the planned vocational educational school might implement.
    a. Local institutions offer in-service training with pay. For example, the Rochester State Hospital pays trainees $356 per month while pursuing a six-month program.
    b. The planned vocational school will offer tuition-free programs to students under the age of twenty-one who are residents of this district.
    c. In support of a and b, a discussion with local medical officials revealed that there is a likelihood of a cooperative program being established between the hospitals and the planned vocational school. While anticipated programs of other institutions should not immobilize our ability to act independently, they should, however, be considered in terms of which institution may most feasibly offer these particular programs.
2. Unlike a nursing program, where we provide the general educational courses and the hospital provides the clinical experience, a psychiatric technology program requires

only "on-the-job" training. Since academic work beyond high school is not essential to enter existing psychiatric technology programs, our college would serve no realistic function in the training of such individuals.

3. Any training program which we would institute would require the availability of facilities of a co-operating hospital in order to fulfill the clinical requirements, and in view of the conditions described above, such a co-operative effort would seem superfluous.
4. People currently employed as psychiatric technicians are approximately 30 years of age or older. It is felt by the employing agencies that people who deal with the mentally disturbed should evidence a level of maturity which is not generally possessed by the entering college freshman. While this is not an insurmountable obstacle, it should be recognized that people of that desired age are usually self-supporting and would no doubt prefer enrolling in a program which paid them rather than enrolling in a program requiring tuition.
5. In view of the fact that other colleges examined had no such programs from which we could draw data and in view of the short duration of our feasibility study, it is felt by this group that more time would be necessary to explore other avenues in the area of Psychiatric Technology with the hope of finding alternatives to the recommendations herein described.

## I. INVESTIGATIVE TECHNIQUES

### A. Consultants:

1. Out-of-state

Dr. J. Lynn Arbogast, Indiana Medical Center
Mr. Ben Colson, Chief X-Ray Technologist, Deaconess Hospital, Wenatchee, Washington
Mr. Harry Davis, Forest Park Community College, St. Louis, Mo.
Dr. Oliver H. Duggis, Forest Park Community College, St. Louis, Mo.
Dr. Frederick E. Templeton, University Hospital, Seattle, Wash.

2. Local

Mr. Russell Hanson, Administrative Associate, Mayo Clinic Graduate School of Medicine
Mr. George Kraft, Personnel Training Coordinator, Mayo Clinic Graduate School of Medicine
Mr. Dean Larson, Administrative Assistant, Mayo Clinic
Dr. Gerald Needham, Mayo Foundation Medical Education Staff

### B. Investigative Trips:

Bellevue Community College, Seattle, Washington
Broome Technical Community College, Binghamton, N.Y.
Forest Park Community College, St. Louis, Missouri
Hudson Valley Community College, Troy, N.Y.
University of Indiana Medical Center, Indianapolis, Indiana
Wenatchee Valley College, Wenatchee, Washington

### C. Materials Examined:

In addition to examining the physical facilities of the above mentioned institutions, materials were obtained which outlined in detail the X-ray technology program under investigation. Materials were also obtained from state and federal organizations in the area of X-ray technology; i.e., Organizational Guide for Schools of X-Ray Technology, published by The American Society of Radiologic Technologists and *A R R T*, a report published by the American Registry of Radiologic Technologists.

## II. FEASIBILITY OF IMPLEMENTING A PROGRAM IN X-RAY TECHNOLOGY

### A. Description of the occupation:

X-Ray technologists work in hospitals, clinics, doctor's offices, public health institutions and industrial medical clinics. The armed services and veterans' hospitals generally employ only male technologists.

These technologists assist specialist physicians, called radiologists, in the use of x-rays to examine for broken bones, ulcers, tumors, disease or malfunction of various organs.

The x-ray technologist takes x-ray films, called radiographs. He adjusts x-ray equipment to the correct settings for a specific examination, positions the patient, makes the require number of radiographs and develops and files them.

The x-ray technologist also aids the physician in administerin chemical mixtures to the patient to make certain organs show up clearly in x-ray examinations. The technologist may need to use mobile x-ray equipment at a patient's bedside and in surgery.

### B. What are the manpower needs?

Opportunities in this field are excellent. With the expansion of hospital units and clinics and the increased use of x-ray i government and industry, the demand for qualified technologist is acute. It is anticipated by the American Association of

X-Ray Technologists that approximately 15,000 additional x-ray technologists will be needed in the next five-year period at the national level. A shortage exists throughout the country, especially in communities with small hospitals.

C. How are these needs currently being met?

Currently the manpower needs in this area are not being met effectively. Local x-ray technologists have received on-the-job training at the various medical institutions, or positions are filled by personnel trained outside the local area. According to local medical officials, there is a movement nationally to hire registered x-ray technologists rather than to employ unskilled personnel. Mr. Dean Larson, Mayo Clinic Personnel Officer, indicated that about five x-ray technologists are hired in Rochester annually.

D. Description of the proposed curriculum:

The program in X-Ray Technology consists of two academic years of study at the college and affiliated hospitals. The classroom work is designed to give the student the proper background for understanding the principles involved in his work, and the training in the radiology department of the cooperating hospitals provides the opportunity for the practical application of the college study. Upon the satisfactory completion of this program, the student receives the Associate Degree from Rochester State Junior College. Following an internship period in an affiliated hospital x-ray department, the student may take examinations by the Minnesota State Department of Health to qualify as a registered radiologic technician.

## PROPOSED PROGRAM IN X-RAY TECHNOLOGY

| Freshman Year | | CREDITS F | W | S |
|---|---|---|---|---|
| English 117,118,119 | Freshman English | 4 | 4 | 4 |
| Biological Science 117,118,119 | Anatomy and Physiology | 3 | 3 | 3 |
| *Mathematics 317 | Technical Mathematics | 5 | | |
| | Orientation to the Radiological Laboratory | 3 | | |
| Physical Education 101,102 103 | General Physical Education | 1 | 1 | 1 |
| | Clinical Experience I,II,III | 2 | 2 | 2 |
| | Radiologic Technology I,II | | 3 | 3 |
| Psychology 214, 215 | General Psychology | | 3 | 3 |
| | | 18 | 16 | 16 |

*Students with a grade of C or above in high school algebra are permitted to enroll in Math 317. If grade is lower than a C, or if algebra has not been taken in high school, Math III must be taken as a prerequisite.

| Sophomore Year | | F | W | S |
|---|---|---|---|---|
| | Radiological Technology III, IV, V | 3 | 3 | 3 |
| | Clinical Experience IV,V,VI | 4 | 5 | 5 |
| Chemistry 114 | General Chemistry | 5 | | |
| | X-Ray Theory and Mechanics | 5 | | |
| | Radiological Pathology | | 3 | |
| | Film Critique | | 2 | |
| Health III | Personal Health | | 2 | |
| | Nuclear Medicine Technology | | | 3 |
| | Humanities Elective | | | 3 |
| | | 17 | 15 | 14 |

Note: Those courses listed without department designation are not presently offered at the college.

E. Student Admission Requirements:

The applicant for the X-Ray Technology program must have a high school diploma or its equivalency. The prospective student must have taken biology, chemistry, algebra, and geometry in high school or in college before entering the program. It is also highly desirable that he have background in higher algebra and physics.

### F. Costs:

A consultation with Mayo Clinic personnel--Dr. Gerald Needham, Co-ordinating Director of Allied Health, Dean Larson, Personne Officer, and others--was held on July 5, 1968, concerning the Clinic's willingness to act as a co-operating institution in the implementation of both a Clinical Laboratory Technology program and an X-ray Technology program; however, before firm position is taken by the Mayo Clinic, Rochester State Junior College must submit a program of studies to expert clinicians for their assessment regarding time and costs necessary for the implementation of such programs. Therefore, it is impossible at this time to calculate the anticipated costs of the respective programs until there is a greater degree of commitment on the part of the Mayo Clinic. When and if such a commitment is obtained, a dialogue should develop which will spell out what equipment will be furnished by us and what equipment will be furnished by the co-operating institution; what courses will be taught by us and what will be taught by the Clinic, etc. We would also have to determine whether Mayo personnel would teach at our facilities or at theirs. These are costly determinations which cannot be made at this time. In addition, until a closer dialogue has developed, it is not possible to estimate the number of students who could be involved in such programs.

### G. Special Problems:

The implementation of allied health programs has been determined to be very costly due to the inordinate expense for specialized equipment and facilities. The exact cost or even a reasonably accurate estimate of the implementation would depend on the amount of participation of the local medical institutions in the clinical training.

The participation of the medical institutions is essential to implementing the program. There can be no semblance of quality to the program without the clinical training, and furthermore the program will fail to meet the standards of the American Medical Association. This situation would result in a failure of the program to be accredited.

Since the college portion of the training is so interdependent with the hospital training, the institutions involved must have a sincere commitment toward cooperating in the offering of a quality program. Contracts should exist between the cooperating institutions which accurately describe the instructional roles of the institutions and any fianancial obligations which are a part of the instructional costs.

Recruiting of able students appears to be a problem in this area of allied health. More emphasis must be placed on making the high school student aware of the opportunities in this vocation. In addition to selecting students who are of acceptable academic ability, considerable emphasis should be placed on the emotional stability of the individual as well as his ability to deal with the sick or injured.

H. Recommendations:

The planning, which is a prerequisite to the implementation of allied health programs, dictates a rate of progress which is at best less than rapid. Nevertheless, at this writing the committee is optimistic that the program can and will succeed if the college and medical institutions can form an effective cooperative union. Such a union must be establishe before further planning in the allied health fields proceeds.

It is, therefore, recommended by this committee that the following procedure be followed to continue this study and eventually culminate in a conclusion of the merits of offering courses of study in the allied health areas:

1. Establish liaison contact with the Mayo Foundation for further study of the programs.
2. Determine the degree of commitment which the Mayo Foundation is willing to make toward the specific program.
3. Establish the content and sequence of clinical course offerings, utilizing expert assistance from Mayo staff.
4. Establish an accurate estimate of the costs to the Mayo Foundation and to the Junior College in implementing the program initially and also in its continuance.

## General Recommendations Pertaining to Health-Related Technologies

1. Throughout this feasibility study this committee has indicated the essential role which the co-operating medical institutions plan in the fields of para-medical education. While this is true in most cases, there are exceptions. For instance, our investigative trips revealed that one very successful program which does not rely on a co-operating institution is dental hygiene. While the initial cost in this program is high, there seems to be no difficulty in the recruitment of students into such a program. Therefore, the committee strongly recommends further study in this area which may lead to the implementation of a dental hygiene program in this college.

2. It is also recommended that a study of the allied health areas be continued with emphasis on the possibilities presented by programs in inhalation therapy, dietary technology, and medical records assistant. Also, it would seem wise to re-examine existing pre-professional programs in medical technology, occupational therapy, and physical therapy. A thorough study of courses common to a number of the pre-professional and allied health programs may point up the possibility of other diverging specialties.

# Business - Related Technologies

- DATA PROCESSING

Subcommittee
Russell R. Blankenfeld
John W. Bradley
Donald K. Harkcom

## I. INVESTIGATIVE TECHNIQUES

### A. Consultants

John Amidon, State University of New York at Alfred
James Carbin, Hudson Valley Community College
John Clark, Orange Coast College
Arthur J. Elges, Henry Ford Community College
Ralph D. Holloway, Broome Technical Community College
Frederick C. Mulcahy, Milwaukee Technical College
Richard F. Newell, Erie County Technical Institute
Peter K. Petro, Flint Community Junior College
Charles J. Roche, Flint Community Junior College
Gilbert Saunders, American Association of Junior Colleges
Terry Slattery, International Business Machines
Richard A. Tibbits, Milwaukee Technical College
Gene R. Watkins, Flint Community Junior College

### B. Investigative Trips

Broome Technical Community College, Binghamton, New York
Erie County Technical Institute, Buffalo, New York
Flint Community Junior College, Flint, Michigan
Henry Ford Community College, Dearborn, Michigan
Hudson Valley Community College, Troy, New York
Milwaukee Technical College, Milwaukee, Wisconsin
State University of New York at Alfred

### C. Materials Examined

1. Catalogs and various publications from the above named institutions.

2. Occupational Outlook Handbook, United States Department of Labor, 1966-67.

3. Occupational Outlook, The Minneapolis-St. Paul Metropolitan Area, Minnesota Department of Employment Security, 1966.

4. Supplement to Rochester's Manpower, Rochester Office of Minnesota State Employment Service.

## II. FEASIBILITY OF IMPLEMENTING NEW PROGRAM

### A. Occupational Description - Data Processing Programmer

A programmer converts raw data to symbolic statements and detailed logical flow charts for coding into computer language and solution by means of automatic data processing equipment: He analyzes all or part of workflow charts and/or diagrams representing business problems by applying knowledge of computer capabilities, subject matter, algebra and symbolic logic to develop a sequence of program steps. He confers with super visors and representatives of departments affected by programs to resolve questions of program intent, output requirement, input data acquisitions, and inclusion of internal checks and controls. He converts detailed logical flow charts into symbolic form to represent work order of data to be processed by the computer system. He observes or runs tests of coded programs on the computer, using sample or input data. He analyzes, reviews and re-writes programs to increase efficiency. (This description is set forth in the Dictionary of Occupational Titles, Vol. I, page 567.)

B. What are the manpower needs?

The growth of the field of data processing in the past decade has been spectacular. The U.S. Labor Department estimates that 500,000 more white-collar workers will be needed by 1970 to operate computer equipment. Also, according to the same report, the need for programmers will increase from 30,000, presently, to 300,000. Labor Secretary W. Willard Wirtz said, "The rapidly growing electronic data-processing field represents almost unlimited employment opportunities." Fifty thousand (50,000) people were employed in 1965 as console and auxillary equipment operators. Graduates of the Data Processing curriculum will provide the technical supporting personnel required in programming and be able to move into areas of system analysis and data management. There is a local demand within the city of Rochester and surrounding areas for data processing oriented graduates; i.e., programmers. Most needs are in government agencies, insurance agencies, banks, transportation, public utilities, and manufacturing firms.

C. How are these needs currently being met?

Most data processing programmers and operators are now being trained by computor equipment vendors and users. This training is not sufficient in quantity or quality to meet demands. Business Data Processing is taught as a vocational training course; however, because of opportunities in the data processing field, most students enrolling in the course leave to take employment in some phase of data processing before they graduate with an Associate of Arts degree in data processing which would enable them to enter the field as a junior programmer.

D. Description of proposed curriculum

FRESHMAN YEAR

| FALL | | WINTER | | SPRING | |
|---|---|---|---|---|---|
| Course | Credits | Course | Credits | Course | Credits |
| English 117 | 4 | English 118 | 4 | English 119 | 4 |
| P.E. 101 | 1 | P.E. 102 | 1 | P.E. 103 | 1 |
| Health 111 or 114 | 2-3 | Math (D.P.) 310 | 5 | Statistics 212 | 5 |
| Data Proc. 124 | 3 | Data Proc. 125 | 4 | Data Pro. 126 | 4 |
| Math 124 | 5 | Elective | 3 | Intro. Bus | 4 |
| | 15-16 | | 17 | | 18 |

SOPHOMORE YEAR

| FALL | | WINTER | | SPRING | |
|---|---|---|---|---|---|
| Course | Credits | Course | Credits | Course | Credits |
| Accounting 214 | 4 | Accounting 215 | 4 | Accounting 216 | 4 |
| Data Proc. 224 | 4 | Data Proc. 225 | 4 | Data Proc. 226 | 3 |
| *Electives | 8 | *Electives | 8 | Human Relations 411 | 3 |
| | 16 | | 16 | Electives | 5 |
| | | | | | 15 |

TOTAL CREDITS: 97-98

*Electives must be chosen in such a manner that they help satisfy the college graduation requirements.

Specialized courses to be added to present course offerings:

Data Processing 124, 125, 126, 224, 225, 226
Math (D.P.) 310

Specialized courses that overlap with other programs:

Data Proc. 124, with other business options and general education
Data Proc. 125, with technology areas, engineering science, math and science
Math (D.P.) 310 with technology areas and math

Prerequisite relationships between conventional general education courses and specialized courses:

Math 124 is a necessary prerequisite for math (D.P.) 310

E. Student Admission Requirements

Students who wish to enroll in the Data Processing course of study must be high school graduates or equivalent. Specific requirements are three years of English and three years of mathematics. Two years of algebra and one year of geometry are required. More mathematics is highly recommended.

F. Costs

1. Staff - $56,000
   a. Director
   b. Assistant Director
   c. Instructors (2)
   d. Instructor Aides (2)
   e. Secretary

2. Equipment - $422,550

| | |
|---|---|
| a. CPU 360/40........................ | $231,000 |
| (1) Operating Attachments | |
| (a) Decimal Arithmetic..... | 1,000 |
| (b) External Interrupt..... | 800 |
| (c) Floating Point......... | 1,940 |
| (d) Selector Channel....... | 8,290 |
| b. 2540 Card Reader Punch........... | 33,950 |
| c. 2821 Control..................... | 45,100 |

| | | |
|---|---|---|
| d. | 1403 Printer...................... | 34,000 |
| e. | 2841 Storage Control.............. | 26,430 |
| f. | 2311 Disk Drive (2 @ $590)........ | 1,180 |
| g. | 1230 Optical Mark Reader.......... | 13,600 |
| h. | 1620 Op. Mrk. Rdr. Attachment.... | 6,950 |
| i. | 534 Card Punch.................... | 3,650 |
| j. | 029 Key Punch (3 @ $2,900)....... | 8,700 |
| k. | Disk Pak (10 @ $490).............. | 4,900 |
| l. | Card Storage Cabinet (3 @ $220).. | 660 |
| m. | Disk Files (2 @ $200)............ | 400 |
| | TOTAL............................ | $422,550 |

3. Room - $60,000

3,000 square feet of floor space for two rooms and office areas. Rooms must be temperature controlled with raised floors for cable runs.

4. Furniture - $659

| | | |
|---|---|---|
| a. | Desk and Chair.................... | $179 |
| b. | Tables (6 @ $20.00)............... | 120 |
| c. | Chairs (12 @ $30.00).............. | 360 |
| | TOTAL............................ | $659 |

5. Supplies - $8,000

| | | |
|---|---|---|
| a. | Cards............................. | $2,000 |
| b. | Print Out Paper................... | 2,000 |
| c. | Miscellaneous..................... | 4,000 |
| | TOTAL............................ | $8,000 |

6. Maintenance - $10,200 ($850/month)

7. TOTAL IMPLEMENTATION COSTS - $557,409

G. Special Problems

1. Large sums of money to purchase equipment, i.e., computer, key punches, and supporting unit record equipment.

2. Obtaining qualified staff.

3. Space in future building phases.

H. Recommendations

1. Data processing be added to the curriculum of Rochester State Junior College, beginning in the fall of 1970.

   a. Financing must be obtained to properly equip the program.

   b. Surveys show a need for trained programmers on local, state and national level as illustrated by U.S. Department of Labor statistics, surveys of schools visited and inquiries in the local community.

2. An application for a grant from the Office of Computing Activities, National Science Foundation be filed as soon as possible to provide necessary funding for the program.

3. Staffing for the program should be drawn from within the local college system. Necessary training should be given by in-service training, summer institutes and by funded leave of absence for further study.

4. The program should be oriented to computer programmers-operators and not unit record equipment operators.

5. Courses should be made available to students in other areas of study.

6. Students be allowed to enter the program at any time they have met the entrance requirements.

7. An advisory committee be found to advise in curriculum revision and additions.

8. A follow-up study be made and kept of all students entering the program for evaluation.

9. Investigate the possibility of exchange teaching with Orange Coast College, Costa Mesa, California.

## PRIORITIES AND OVER-ALL COMMITTEE RECOMMENDATIONS

The workshop committee's recommended plan of action is stated below:

During the 1968-69 academic year:

1. Plan and host a series of meetings with various local and state-wide groups for the purpose of conveying the contents and recommendations of this study to them.
2. Begin formal revision procedures for existing programs based upon the committee's recommendations with the college curriculum committee, administration, local advisory committees, etc. These revisions would strengthen existing programs in order to meet national accrediting association standards(e.g. Engineer's Council for Professional Development, National League of Nursing, etc.).
3. Prepare and submit all applications for new programs to the Minnesota Junior College Board as follows:
    a. Clinical Laboratory Technology
    b. X-Ray Technology
    c. Mechanical Technology
        (1) Drafting and Design Major
        (2) Manufacturing Major
    d. Medical Electronics
    A sophomore option of our existing Electronics Technology program.
    e. Data Processing

NOTE: The actual year in which to implement a new program will be dependent upon the allocation of funds for staff, equipment, facilities and availability of adequate community clinical facilities.

4. Prepare and submit applications for available public and private equipment grants for each of the new programs.
5. Appoint ad hoc study committees to investigate the feasibility of other new career programs that were given a cursory examination during the course of this workshop. Several are suggested below:
    - a. Inhallation Therapy
    - b. Dental Hygiene
    - c. A "communications" option of our existing Electronics Technology program.
    - d. A "construction" option of our existing Civil Engineering Technology program.